



FRIDAY, APRIL 4.

CONTENTS.

ILLUSTRATIONS :	PAGE.	EDITORIALS :	PAGE.
Superstructure — Chicago & South Side Rapid Transit Railroad.....	226	The Demand for Railroad Stocks.....	235
Manitou & Pike's Peak Railroad.....	227	EDITORIAL NOTES.....	234
Traffic Capacity of the New York & Brooklyn Bridge.....	228	NEW PUBLICATIONS.....	236
Heintzelman's Tender Draw-head with Movable Buffer.....	230	TRADE CATALOGUES.....	236
Locomotive Boilers without Stays.....	230	GENERAL RAILROAD NEWS :	
Improvement in Valve and Cylinder Lubricants.....	231	Meetings and Announcements.....	238
Disk Wheel for Ventilation.....	232	Personal.....	239
		Elections and Appointments.....	239
		Old and New Roads.....	240
		Traffic.....	241
CONTRIBUTIONS:		MISCELLANEOUS :	
Destruction of a Bridge by Wind.....	225	Technical.....	237
Easement Curves.....	225	Railroad Law.....	237
Balancing Compound Locomotives.....	225	The Scrap Heap.....	237
		The Wear of Steel Tires.....	237
		Accounting Officers' Recommendations.....	230
		Reports of State Railroad Commissioners.....	231
EDITORIALS :		The Mississippi Floods.....	231
Coupler Makers and Coupler Lines.....	234	Protecting Tracks from Snow Storms.....	232
The Minnesota Decision.....	234	Breaking of a Cable on the Brooklyn Bridge.....	232
A Word more about Counterbalancing.....	235	The Composition of Boiler Scale.....	232

Contributions.

Destruction of a Bridge by Wind.

Richmond & Danville Railroad Co.,
WASHINGTON, D. C., March 29, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of March 28, page 215, under the head of "Bridge Accidents," I note the following:

"The Spartanburg & Union Railroad bridge, over Broad River, near Columbia, S. C., was floated off its abutments, and broken to pieces, by a flood accompanying the severe storm of the 22d."

I would say that the bridge in question consisted of seven spans, 127 ft. each, of Howe truss, and was entirely destroyed on the 22d by a cyclone which passed up the river from the southwest. There was no flood of consequence in the stream at the time; in fact, the bridge rested on abutments and piers at least 15 ft. above high water mark.

W. H. GREEN.

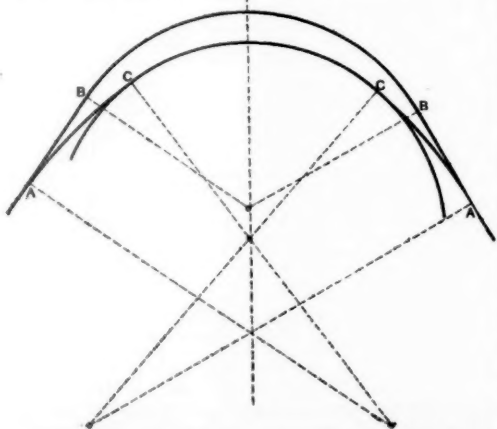
W. H. GREEN,
Asst. Gen. Manager.

Easement Curves.

The Pennsylvania Railroad Co.,
PHILADELPHIA, PA., March 22, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

... The elastic curve theory is all very nice in an office or college class room, but I will venture to say that the people who are so enthusiastic in regard to this matter could not run the curve twice in the same place on the ground. The plan shown below answers every purpose and was adopted by this department 10 to 12 years ago in building the elevated railroad into Philadelphia. We had on the elevated road just west of the Schuylkill River a four-degree curve, and in order to ease the shock of trains striking this curve, and to provide for the elevation, we drew the curve in at the centre a sufficient distance to give us a chance to get in a 30-minute curve at each end, 200 ft. long.



The original P. C.'s are at *B B*. The 30-minute curves leave the tangents at *A A* and run into the four degree curve at *C C*.

Our rule for the elevation of a four-degree curve for fast passenger trains is as follows: At the beginning of the 30-minute curve both rails are level; when we get to the end of the rails, 200 ft. away from the P. C., we have got the total elevation of 4 in., and we keep these 4 in. of super-elevation all the way around the four-degree curve, and run it off at the other end in the same way that we did at the beginning. It was formerly our practice to commence this elevation from 100 to 200 ft. away from the P. C. of the curve on the tangent. This has a tendency to throw the train against

the low rail before it reaches the P. C., and then it continues in the same line until it brings up against the outside rail with a sensible shock, thus making two rough places in the track; the first, where the train begins to fall over toward the low rail on the tangent, and the second where the train strikes outside rail. The plan shown on the sketch entirely obviates this, as the 30-minute curve is sufficient to keep the wheel against the outside rail until it strikes the four-degree curve.

You will notice that this is a curve that can be retraced by any person who can run a transit, even if the point of tangent is lost, and, as I said before, I am very much in doubt whether some of our scientific young men can retrace their elastic curve in the same place on the ground after the original points have been lost.

Wm. H. BROWN, Chief Engineer.

Balancing Compound Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

To me "Tenax" seems decidedly in error in advocating a three-cylinder locomotive with cranks at 120 deg. Such an engine would have no balance at all without counterweights, for, revolving in a different plane, the pistons, etc., of one cylinder have no power to balance those of another. I have long advocated the compounding of locomotives on the plan suggested by "Tenax," so arranged that the outside cylinders would be balanced in the usual way, and the inside by means of an equal counterweight in each wheel, but there would still exist the unbalanced vertical action which, as "Tenax" truly remarks, makes it now necessary to build a road for the engine, not an engine for the road.

I was hardly prepared for the great difference of English and American moving parts weight. (See *Railroad Gazette*, Dec. 20, '89.) When one considers the difference of effect on the rail of the mean of the eight cases, due to the wheel diameters, it is seen that it may mean from five to eight fold greater vertical action in American engines, though at the risk of repetition, may I again suggest what was suggested by me some weeks ago, that locomotives, whether simple or compound, might be made with three cylinders, the two outside ones with cranks 180 degrees from the one inside cylinder and working on one axle. Such appears to be the simplest possible form of perfectly balanced engine, the inside moving parts being equal in weight to both the outside. It is very clear that no difficulty need be apprehended in contriving this, for if the inside cylinder is fitted with American piston, etc., it would have moving parts equal to two outside English fitted cylinders. Further, if the inside cylinder were high-pressure it could well afford to carry heavier parts.

So long as American bridge practice is carried out on its present basis there must also be a constant endeavor on the part of the bridge men to vary the design and construction of locomotives to give a more even rail pressure than at present obtains, and such variation will tend to go beyond a mere reduction in weight of parts or increased wheel diameters, and undoubtedly the present tendency to bring up speeds more nearly to English speeds will develop very numerous weak points in bridge floors, especially in the connections of stringers to floor beams and similar parts, as also in the general structure due to accumulative vibratory stresses.

Undoubtedly much may be done in the way of reducing weights of reciprocating parts. Few will deny that the ordinary English piston is strong enough, if of good material, and it seems equally apparent that an American crosshead has a superabundance of material about it, which is usually looked on as an English fault.

Compound locomotives have by no means the universal approval of railway men here. They are running in large numbers on the London & North-western, but, as pointed out, are of immense cylinder capacity. They are also used on the North-eastern under Mr. Worsdell. Mr. Stroudley who has just died, and who was looked on as one of our brightest men, had no faith in them, and they are not in favor on the Midland or Great Northern. Compounding seems better suited to freight than to passenger engines, and yet has been applied chiefly to the latter, though its value is clearly greater in slow-moving pistons.

Long experience in compound engines and all recent tests of engines other than locomotives, prove that it is important to keep the first cylinder hot, but that jacketing of the last cylinder for compound engines is unnecessary and does not result in economy. Also it is equally true that jacketing, to be truly efficient, must be carried out with a jacket temperature higher than that of the boiler steam. Now in all locomotives the initial cylinder pressure is less than the boiler pressure. This shows that the initial steam must be wiredrawn, and if wiredrawn and possibly initially dry; it must be superheated, and cannot, therefore, gain much heat from a jacket filled at boiler pressure with non-superheated steam. In the three-cylinder compound locomotive of the Webb type the low-pressure cylinder is placed in the hot smoke box, and this is hot jacketed, which is unnecessary, while the high-pressure cylinders are placed outside in the atmosphere, exposed to full radiating action. This is clearly an inversion of correct steam practice, though it is, of course, a matter of opinion whether it is convenient and suitable as a mechanical arrangement. With a single high-

pressure cylinder placed in the hot smoke box the advantage would be gained of an efficient jacket to this important cylinder, and an entire freedom from radiation may be secured. The outside or low-pressure cylinders should, of course, be protected, but will lose less than two outside high-pressure cylinders would, if only by reason of their lower temperature. No disadvantage is apparent from a mechanical point of view in the three-cylinder arrangement. Indeed, the use of three cylinders of one diameter seems a cheaper construction than two cylinders with two different diameters of greatly varying size. Further, the dimensions of exhaust ports of a pair of 18-in. low-pressure cylinders may be greater than those of a single equivalent 25-in. cylinder, and it is with low-pressure steam that the largest capacity for exhaust is necessary and the greatest steamport length is required.

Engineers accustomed to provide for the requirements of simple engines are very apt to overlook the port differences necessary in compound work. The weight of steam passing an inch opening in any time is practically proportionate to the pressure. Ninety lbs. absolute pressure will drive three times the weight of steam through an opening that 30 lb. steam is capable of doing. This difference comes in with heavy effect with respect to the ports of steam cylinders, and demands consideration. This alone ought to carry weight in determining cylinder arrangements, and added to the above proved facts as to hot jacketing, must possess special importance in the compound locomotive, which is a machine working with a hot fluid having critical temperatures, and cannot be varied far from that of the marine and stationary prototype if the best results are to be secured. Until the compound locomotive has been tried with hot jacketed, high-pressure cylinder it cannot be claimed that it has had a fair trial. It must not be overlooked that in English practice, even outside cylinders get a greater benefit from the waste heat in the smoke box than is the case with the American outside valve chest. The highest valve chests come into the smoke box, and so far are correctly placed, and the simple engine seems to be better looked after as a heat engine than the usual run of compounds, which heat and protect a cylinder hardly requiring it, and probably such heating does little else than superheat some of the escaping steam to the funnel, or dry the exhaust. Considerations of both mechanical fitness, workshop fitness, and a knowledge of the steam engine performances, all seem to point to the design and arrangements I have indicated.

W. H. BOORN.

W. H. BOOTH.

The Wear of Steel Tires.

At the last meeting of the Central Railway Club, March 26, two reports on this subject were presented. Mr. F. B. Griffith, Division Master Mechanic D. L. & W., chairman of the committee, said that, in order to avoid a one-sided expression of opinion, he decided not to call the committee together, but had asked each of them to prepare an individual report. The report of Mr. Griffith and another by William A. Foster, Superintendent of Motive Power Fall Brook Coal Co., were presented, and extracts follow:

Mr. GRIFFITH: The great diversity of conditions makes it an almost impossible task to determine the uniform wear of tires, but I would for this report confine the wear of tires on drivers to the following causes:

1st. The slip of an engine determines the wear of the tires.

3d. The grade of a road and the engine determine the slip of an engine.

There is no rule that will govern the wear of tires for universal purposes. The following table shows the mileage per $\frac{1}{4}$ in. wear of four engines in identical service on level track. It will be seen that No. 98 has considerably greater mileage per $\frac{1}{4}$ in. than the heavier ones.

Engine.	Cylinder.	No. of drivers.	Diam. of wheel centres.	Weight on lbs.	Miles per 164 inch year.
No. 87.....	18 x 24	6	50 1/2	23,600	3,554
" 88.....	"	"	"	"	3,633
" 90.....	"	"	"	"	3,596
" 98.....	19 x 24	"	"	81,000	6,650

Again, take engines Nos. 83 and 84 of the same class as No. 98, but on grades of 32 to 63 ft. per mile.

No. 83 has made.....	4,681 miles per 1-61 wear.
No. 84 " "	4,780 " "

The difference between these engines and No. 98 was simply in the grades.

There is one more illustration I will present in relation to overcylindered engines. We had a class of engines 19-in. cylinders, 24-in. stroke, four drivers, 56-in. wheel centres, weight 71,300 lbs. on drivers, 21,500 lbs. on trucks. This class of engines made 45,000 miles to the $\frac{1}{2}$; 2,250

We made a change and placed a 62-in. wheel centre under them, and they now make 110,000 miles to the $\frac{1}{4}$ wear; 5,500 to $\frac{1}{4}$.

These engines that I have selected for this report are the only engines that have steady runs, thus giving no preference to power.

Mr. FOSTER: I have had very little experience with steel tired wheels under cars, and so I wrote to Mr. F. D. Adams, General Master Car Builder of the Boston & Albany Railroad. In his reply he says: "This is a very



MANITOU & PIKE'S PEAK RAILROAD

a spread top column. At stations and at points requiring through spans, the longitudinal girders will rest upon or frame into a transverse girder resting upon square top columns, provided with suitable brackets beneath the cross-girders.

Rivets and bolts connecting parts of any member must be so spaced that the shearing strain per square inch does not exceed 7,500 lbs., or three-fourths of the allowed tension strain per square inch on that member; the bearing strain per square inch upon projected semi-intrados of rivet or bolt hole shall not exceed 12,000 lbs., or one and a half times the allowed tension per square inch on the member. For field rivets reduce these limits 25 per cent.

Iron in web plate must not have greater shearing strain than 4,000 lbs. per square inch—no web less than $\frac{1}{8}$ in. thick.

Web plates shall be stiffened at intervals equal to depth of girder when thickness of web is less than one-sixtieth of the depth.

Web plates when spliced must be spliced with plate on each side. No rivet shall be nearer the edge of a piece than $1\frac{1}{2}$ diameters. In punching, the diameter of the die shall in no case be more than $\frac{1}{8}$ in. larger than the punch. In compression members, the pitch of rivets for a distance of twice the width of the members shall not exceed four diameters of the rivet. All 15-in. columns shall be latticed together with 4-in. \times $\frac{1}{2}$ -in. bars.

Material.—All wrought iron must have an elastic limit of not less than 25,000 lbs. per square inch and be tough, fibrous and uniform in character. Finished bars must be thoroughly welded during the rolling without seams, blisters, buckles, cinder spots or imperfect edges.

All tension members shall stand the following tests: Full-sized pieces of flat, round or square iron, not over 4 $\frac{1}{2}$ in. in sectional area, shall have an ultimate strength of 50,000 lbs. per square inch and stretch 12 $\frac{1}{2}$ per cent. of their length. Tested in specimens of uniform sectional area of at least $\frac{1}{2}$ sq. in. for a distance of 10 in., they shall show an ultimate strength of 52,000 lbs. per square inch and stretch 18 per cent. in 8 inches. Bars of larger sectional area when tested in full section shall be allowed a reduction of 1,000 lbs. per square inch for each additional square inch section down to a minimum of 46,000 lbs. per square inch. Specimens of uniform sectional area of at least $\frac{1}{2}$ in. for 10 in. will be allowed a reduction of 500 lbs. per square inch for each additional square inch section over 4 $\frac{1}{2}$ sq. in. in original bar down to a minimum of 50,000 lbs. per square inch.

Specimens of same size from angle and other shape iron shall have an ultimate strength of 48,000 lbs. per square inch and elongate 15 per cent. in 8 in.

The same sized specimens from plates under 24 in. in width shall have an ultimate strength of 48,000 lbs. and stretch 15 per cent. in 8 in. From plates over 24 in. an ultimate of 46,000 lbs. and elongate 10 per cent. in 8 in.

Bending and Nicking Tests.—All iron for tension must bend to an angle of 90 degrees cold around a curve whose diameter is not over twice its thickness without cracking. At least one specimen in three must bend 180 degrees. Nicked on one side and bent by a blow from a sledge, the fracture must be nearly all fibrous, with but few crystalline spots.

Specimens from angle, plate and shaped iron must bend cold to 90 degrees around a curve whose diameter is not over three times the thickness without cracking; must show mostly fibrous in nicking test. All rivet iron must bend double, cold, so sides touch without cracking.

The moving load is 16,000 lbs. on each pair of drivers, 5 ft. centres, two pairs of drivers; 6,000 lbs. on each pair of engine truck wheels, and 16,000 lbs. on each 4-wheel car truck, the truck wheel base being 5 ft., and 30 ft. centre to centre of trucks. The accompanying table gives data of dimensions, strains, and moments.

The Manitou & Pike's Peak Railroad.

An important rack railroad, both as to length and as to grades surmounted, is that now building from Manitou, Colo., to the summit of Pike's Peak. It is destined entirely for pleasure travel, and it is intended to have it finished in June, to catch this season's business. The perspective view given here was drawn from a photograph, and will give a general notion of the location of the road, which follows approximately the white line in the foreground and the broken line shown on the distant peak. This road is being built on the Abt system, under the direct supervision of Mr. W. Hildenbrand, the American representative of Mr. Abt.

The length of the road is 46,158 ft., or almost exactly 8 $\frac{3}{4}$ miles. The altitude at the Manitou station is 6,000 ft., and at the summit 14,200 ft. above sea level; the total ascent being 7,000 ft., or an average of 846 ft. per mile. The maximum grade is 25 per cent. Over 22 per cent. of the line has a grade of from 22 $\frac{1}{2}$ to 25 per cent. The grades of the whole line are very nearly as follows:

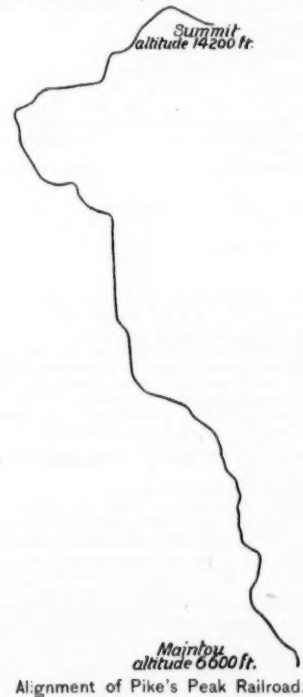
22 $\frac{1}{2}$ to 25 per cent. (1,188 to 1,320 ft. per mile).....	feet.
19 $\frac{1}{2}$ to 22 $\frac{1}{2}$ per cent. (1,030 to 1,188 ft. per mile).....	10,229
15 $\frac{1}{2}$ to 19 $\frac{1}{2}$ per cent. (818 to 1,030 ft. per mile).....	6,320
12 $\frac{1}{2}$ to 15 $\frac{1}{2}$ per cent. (660 to 818 ft. per mile).....	7,675
12 $\frac{1}{2}$ per cent. and less	4,295
	17,139

This is not by any means the steepest existing rack road. The Mount Pilatus line, 2.77 miles long, opened last year, has a maximum grade of 48 per cent. and an average of 42 per cent. The maximum grade of the Mount Washington road, built in 1896 (89), is 37.5 per cent.

A notion of the general alignment can be got from the plan shown. The line is pretty crooked but there are adhesion roads with sharper curves and more of them. The total of straight line is 28,378 ft., and of curves 18,477 ft., as taken from a large and apparently accurate plat. That is, about 39 per cent. of the line is on curves. The total curvature is over 1,844 degrees, or about 211 degrees per mile. The sharpest curves are 16 degrees; of these there are many.

The road-bed is not extraordinary. It is simply intended to be a very good example of the usual type. There are several stone culverts and a number of short bridges. The latter are all plate girders on masonry abutments. Some of them stand on pretty steep grades. The rails are laid on red spruce and oak ties, 8 in. face, 7 in. deep, 9 ft. long, laid 20 in. centres. At intervals of 200 to 600 or 1,000 ft., dependent upon the grades, anchorages are made by straps fastened to the ties, and carried up grade to eye-bolts set in blocks of masonry. As the whole track is consolidated, not only by the ordinary spiking, but by the extra fastenings of the rack rail, it is thought that these anchorages will be sufficient to provide against movement of any part down grade. No special provision will be made against movement at the bridges.

The track rails are 40 lbs. per yard, 3 $\frac{1}{2}$ in. high, made by the Illinois Steel Co. The rack rails consist of two rack bars set side by side in chairs. They are 4 $\frac{1}{2}$ \times $\frac{3}{8}$ in. and 4 $\frac{1}{2}$ \times 1 $\frac{1}{2}$ in., according to the grades. Each section is 80 in. long and the chairs are 40 in. apart, on each second tie, so that the rack bars break joints. The



Alignment of Pike's Peak Railroad.

teeth are staggered; are 2 in. deep and 4.70588 in. pitch. The material of the racks is Bessemer steel, 70,000 lbs. ultimate strength, 25 per cent. elongation in 8 in., and 45 per cent. reduction of area. These are made at the Cambria Iron Co., Johnstown, Pa. The chairs are of the same steel as the racks, rolled and die forged. They are made by the Johnson Co., at Johnstown, Pa. These are fastened to the ties by 1-in. wood screws.

There is a switch about midway for up and down trains to pass.

Three locomotives on the Abt system are building at the Baldwin Locomotive Works. These will weigh 25 tons and have no adhesion drivers. The rack wheels have 15 teeth with 4.70588 in. pitch. The tank will hold 700 gallons and be filled four times in each round trip. One

* The reader will notice that the sum of these two quantities is 687 feet more than the total length of line given above. It did not seem necessary to hunt for the error in the figures.

SUPERSTRUCTURE CHICAGO & SOUTH SIDE RAPID TRANSIT R. R.—DIMENSIONS, MOMENTS AND STRAINS.

Longitudinal span C to C of supports.	Max. bending moment per track, combined D and L loads.	Depth of girders.	Max. chord strain, combined L & D loads.	Allowed stress per sq. in.	Composition of chords; angles.	Eqvt. weight per lin. ft. per girder.	Max. shear in web.	Thickness of web.	Eqvt. distr. load.
35 ft. to 40 ft.	484,195 ft. lbs.	42 in.	73,362	9,000 lbs.	6 in. \times 4 in. \times $\frac{1}{8}$ in.	1,210 lbs.	24,200	$\frac{3}{8}$ in.	48,400
40 ft. to 45 ft.	586,655 ft. lbs.	48 in.	74,441	" "	6 in. \times 4 in. \times $\frac{1}{8}$ in.	1,158 lbs.	23,055	$\frac{3}{8}$ in.	52,110
45 ft. to 50 ft.	701,765 ft. lbs.	48 in.	89,969	" "	6 in. \times 4 in. \times $\frac{1}{8}$ in.	1,122 lbs.	27,550	$\frac{3}{8}$ in.	55,160
50 ft. to 55 ft.	838,677 ft. lbs.	48 in.	107,522	" "	6 in. \times 4 in. \times $\frac{1}{8}$ in.	1,109 lbs.	30,497	$\frac{3}{8}$ in.	60,965
55 ft. to 60 ft.	987,149 ft. lbs.	54 in.	114,784	" "	6 in. \times 6 in. \times $\frac{1}{8}$ in.	1,096 lbs.	32,890	$\frac{3}{8}$ in.	65,700
60 ft. to 65 ft.	1,116,243 ft. lbs.	54 in.	129,795	" "	6 in. \times 6 in. \times $\frac{1}{8}$ in.	1,056 lbs.	34,320	$\frac{3}{8}$ in.	68,640

engine will push two cars weighing 42,000 lbs. loaded. The average speed will be five miles per hour; on the 25 per cent. grades it will be three miles per hour, and on the eight per cent. grade, eight miles.

Six cars are building by the Wason Manufacturing Co., Springfield, Mass. Each will have 50 seats, and weigh 21,000 lbs. loaded. Each car will have two pinion brakes worked by hand. The engines will have steam and hand brakes fitted to the gear wheels. In the descent no steam will be used, but the cylinders will act as brakes, being equipped with the Le Chatelier brake.

The principal officers of the road are: Major John Hulbert, President; Mr. R. R. Cable (Chicago, Rock Island & Pacific), Vice-President; Mr. J. B. Glaser, Secretary and Treasurer; Mr. T. F. Richardson, Chief Engineer, and Mr. W. Hildenbrand, Consulting Engineer.

It is said to be the intention of the company to light the whole route by electricity. Those who have ascended Pike's Peak, through the wild gorges of its slopes, and climbed the bald dome of rocks rising nearly 2,000 ft. above timber line, can imagine what a striking spectacle this line of glittering lights, running up to the stars, will be. But many lovers of mountains who remember Pike's Peak before the days of carriage roads, and when there was scarcely a bridge trail, would gladly do without the spectacle, and indeed without the railroad itself.

Traffic Capacity of the New York & Brooklyn Bridge.

[CONTINUED FROM THE RAILROAD GAZETTE OF MARCH 28.]

The condition named above, that the trains shall be moved from the incoming to the outgoing platform without stop or interference, one with another, does not obtain where the transfer is made over switches, as shown in figs. 2, 3 and 4, since to surely prevent collision, first, if but one switch is used a train must not leave the incoming platform until the preceding train has passed the clearance point at *F*, and second, if two switches are used also a train must not leave the end of the switch *D* until the following train has passed the clearance point at *E*. In the first case, let the time in which a train starting from rest at the incoming platform is run out on the switch and back past the clearance point at *F* be *e*; then that a train from the incoming platform may clear the preceding train,

$$b + p + H = b + p + e; \text{ hence } H = e; \quad (12)$$

also, $e = \text{or } > p + e;$ (13) whence with but one transfer switch in use, the headway between trains on the main lines cannot be less than the time in which a train starting from rest at the incoming platform passes the clearance point at *F*, nor can this be reduced below a certain limit.

In the second case, the general solution as applied to a double slip and switch system is more complex. Referring to figs. 3 and 4, and designating the trains which run on the *A* tracks and switch by *A*, and those on the *B* tracks and switch by *B*; let the times respectively the *A* and *B* trains remain, at the incoming platforms be *p* and *P*, at the switches be *w* and *W*, and at the outgoing platforms be *q* and *Q*; the time in which a train runs from the incoming platform out on its switch or from its switch back to the outgoing platform be *f*; the time in which when running in from the switch it clears the spur at *P* be *g*, and when running out to the switch it clears the crossing at *E* be *G*; also as before, let the headway between trains on the main line be *h*. Mr. Leverich deduces certain general equations for this case, which we give, omitting, however, the successive stops, for want of space.

First.—If the transfer is made by locomotives alone:

$$h = \frac{w + 2f}{2} = \frac{W + 2f}{2}, \text{ and } w = W; \quad (18)$$

also, $h = (p - P) + w + (f - g);$ (19)

and $p - P = Q - q.$ (20)

From this it appears that the headway *h* is equal to one-half the time $w + 2f$, in which the transfer from the incoming to the outgoing platform is made; also to the sum of the difference in times $p - P$, a train remains at the two platforms, the time *w*, it remains on its switch and the time, $f - g$, in which it runs from the crossing to the switch. Again for a given headway *h*; the time, *w*, a train must remain on its switch and the difference in times, $p - P$, it must remain at its platforms, have a fixed value; and as *h* is increased, $\frac{w}{2}$ will increase and $p - P$ will decrease the same quantity.

Second.—If the transfer is made by cable and locomotive, that a train may leave the incoming platform, when the preceding train has cleared the spur:

$$h = \frac{w + f + G}{2} = \frac{W + f + G}{2}; \text{ and } w = W; \quad (21)$$

that *s*: the headway *h* is equal to half the time $w + f + G$, in which the transfer from the incoming platform to and from the switch and past the crossing is made; other deductions are as for the first.

Assuming that a train is not started to or from its switch until its track is clear, and that starting from rest it is moved at full speed or moving at full speed it is brought to rest in two-thirds its length, or for a four-car train in 133½ ft.; then *f* may be taken at 40, *g* at 34, and *G* at 26 seconds. Also, that each train coming into the station may begin to stop, if necessary, at a danger point a train length or 200 ft. back from the preceding train on the same track at the incoming platform,

$$h = \frac{p + R}{2}; \quad (24)$$

in which *R* is the time required for the train to run from this point and come to a stop at the platform, or 37 seconds. From this data Table IX, is constructed.

It will be noticed that up to 1 minute and 14 seconds headway for trains transferred by locomotive alone, and up to 1 minute headway for trains transferred by cable and locomotives, they are alternately a longer and shorter time at the incoming platforms and contrariwise at the outgoing platforms; and that with headways greater than these the trains may be at either platform a time equal to the headway.

To aid in fixing proper values for the terms in the general equations established above, expressing the

TABLE IX.—SCHEDULE SHOWING THE RUNNING OF FOUR-CAR TRAINS INTO AND OUT OF A STATION WITH DOUBLE SLIPS AND SWITCHES.

Times are in seconds.										
FIRST—TRAINS TRANSFERRED BY LOCOMOTIVES ALONE.										
Headways = <i>h</i>	40	45	50	55	60	65	70	74		
Trains remain on switches = <i>w</i>	0	10	20	30	40	50	60	68		
Difference in times, trains remain at platforms = $p - P$	34	29	24	19	14	9	4	0		
<i>A</i> trains remain at incoming platform = <i>p</i>	57	64	64	64	64	64	64	64		
<i>B</i> trains remain at outgoing platform = <i>P</i>	23	33	40	45	50	55	60	64		
<i>A</i> trains remain at outgoing platform = <i>p</i>	17	10	10	10	10	10	10	10		
Platforms are vacant.....										
SECOND—TRAINS TRANSFERRED BY CABLES AND LOCOMOTIVES.										
Headways = <i>h</i>	33	35	40	45	50	55	60			
Trains remain on switches = <i>w</i>	0	4	14	24	34	44	54			
Difference in times, trains remain at platforms = $p - P$	27	25	20	15	10	5	0			
<i>A</i> trains remain at incoming platform = <i>p</i>	43	47	57	60	60	60	60			
<i>B</i> trains remain at outgoing platform = <i>P</i>	16	22	37	45	50	55	60			
<i>A</i> trains remain at outgoing platform = <i>p</i>	17	13	3	0	0	0	0			
Platforms are vacant.....										

several conditions which limit the running of trains as proposed, reference is had to observations made at the two stations, of the movement of trains during the busy morning and evening hours, recorded in Table X.; also at New York station, to determine the time in which trains, starting from rest at outgoing platform were first moved at full speed, recorded in Table XI. In each case the observations were made on several trains running in the usual order; they were operated by the men then assigned to that work, and were performing regular service. [We have condensed these tables, retaining only the means.—EDITOR.]

TABLE X.—ARRIVAL AND DEPARTURE OF TRAINS AT AND FROM THE STATIONS.

	THREE-CAR TRAINS.	
	Brooklyn station. m. s.	New York station. m. s.
Mean headway of train on the main line.....	1 29.8	1 30.1
Mean time in which passengers were discharged at the incoming platform.....	30.8	21.3
Mean time in which trains were transferred from one main line to the other.....	1 42.1	1 11.9
Mean time in which passengers were received at the outgoing platform.....	44.2	42.9

FOUR-CAR TRAINS.	
New York Station, beginning at 5 o'clock, P. M. Headway, 1 m. 30s.	
Time in which passengers were discharged on the incoming platform.....	31.5
Time in which train was moved from the incoming platform to switch.....	48.8
Time that train stood on the switch.....	22.4
Time in which train was moved from the switch to the outgoing platform.....	32.9
Time in which passengers were received at the outgoing platform.....	40.7
Total time between arrival and departure of train at and from the station.....	2 56.

TABLE XI.—TIMES IN WHICH TRAINS WERE MOVED FROM REST TO CABLE SPEED AT OUTGOING PLATFORM, NEW YORK STATION; THE LENGTHS OF CABLE THAT PASSED THE STARTING POINT, AND THE SPACES OVER WHICH THE TRAINS MOVED IN SUCH TIMES.

	Eleven trials.	Six trials
Number of cars in train.....	3	4
Time of movement observed, seconds.....	14.5	11.4
Length of cable which passed the starting point; computed, ft.....	213.1	167.5
Space over which the train moved; computed, ft.....	106.2	83.8

Again referring to the "Typical diagrams of terminal stations," figs. 2-6, collating and applying the data above given, the minimum headway between trains on the main lines will be as follows:

First.—As shown in fig. 2, the minimum headway (equation 12), *H* equals *e*, the time in which a train, starting from rest at the incoming platform, is run out on a switch and past the clearance point. This by computation, assuming that a train thus moved acquires full speed in two-thirds its length, or in 133½ ft., without

allowance for delay at the end of the switch when the movement is reversed, is one minute and six seconds; by Table X., the mean time at New York station in which three-car trains were transferred, was one minute and 12 seconds, and in which four-car trains were transferred was one minute and 22 seconds; whence under the most favorable conditions for handling the trains, this for four car trains cannot be safely taken less than one minute and 20 seconds.

Second.—As shown, figs. 3 and 4, the minimum headway *H*, permitting trains to remain not less than 40 seconds at each of the platforms, to discharge and receive passengers, per Table IX., is 45 seconds.

Third.—With, at each terminal, double incoming and outgoing tracks and their platforms as before, and double transfer loops, as shown for a triple slip system, fig. 5, whereby the trains may be moved from one platform to the other without stop or interference, also together constituting a double slip system, the minimum headway (equation 10), *H*, is not less than one-half the sum of *p*, the time a train remains at a platform, and of *c*, the time in which the train on departure is moved its length. By computation, assuming as before that a train acquires full speed in two-thirds its length or 133½ ft., this last is 21 seconds, which fairly agrees with the observations recorded, Table XI.; whence the minimum headway may be taken at 32 seconds.

Fourth.—With triple incoming and outgoing tracks, their platforms and triple transfer loops at each terminal, together constituting a triple slip system, as shown in fig. 5, the minimum headway (equation 11), *H*, is not less than one-third the sum of *p* and *c*, or 21 seconds. This is not so great as the minimum headway between trains on the main lines, heretofore taken at 25 seconds; hence, by this system the maximum capacity is reached.

In Table XII, these headways and the number of trains and cars which may be run thereon are collected and compared with headways and trains as at the present time.

TABLE XII.—MAXIMUM CAPACITY OF A PAIR OF MAIN LINES AS LIMITED BY DIFFERENT TERMINAL ARRANGEMENTS.

Terminal arrangements.	Minimum headways. M. S.	Number per hour dispatched.		Capacity compared with 4-car trains running on 1½ min. headway.
		Of 4-car trains.	Of cars.	
Single slip system with forked switches, as now operated.....	1-30	40	160	1
First—Single slip system with forked switches, operated to maximum capacity.....	1-20	45	180	1½
Second—Double slip system with forked switches.....	0-45	80	320	2
Third—Double slip system with loops.....	0-32	112½	450	2½
Fourth—Triple slip system with loops, as limited by capacity of the main lines.....	0-25	144	576	3½

Mr. Leverich states certain conditions to be observed as to station arrangements and certain improvements required. He shows that the cost of handling cars at the terminals by locomotives is eight and a half times as much as it would cost to do the same work by cables.

That a double or triple slip system may be operated with the greatest possible efficiency and safety; for each part there should be a separate railroad and hauling cable, forming with its main lines on the structure proper, its branches at the stations and transfer switches or loops at the terminals, an entire and independent circuit, without a break in the tracks except where the trains are run from and to the storage-yard; special automatic appliances being inserted where the branches separate from or join to the main lines at the crossings of single tracks. For this, on the bridge structure, the rails of the double or triple systems on the same side of each track should be laid quite close together and with a space between them sufficient to allow clearance of the car wheel flanges; the cables should also run side by side, each in the centre of its pair of rails. The grips should permit the trains to be stopped, started, or run slower or faster than the cable, without dropping it. This arrangement of tracks and cables will allow whole

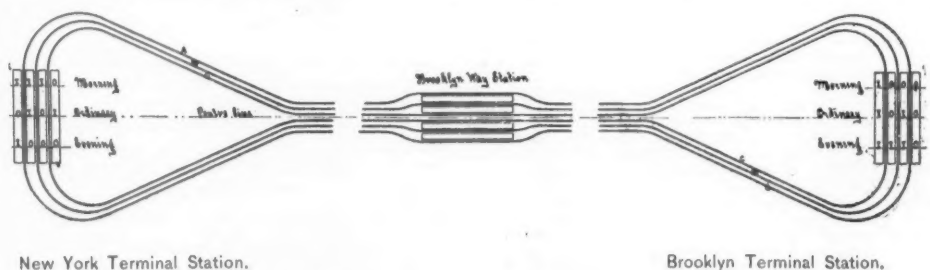


FIG. 9.—DIAGRAM SHOWING ARRANGEMENT OF TRACKS AND STATIONS.

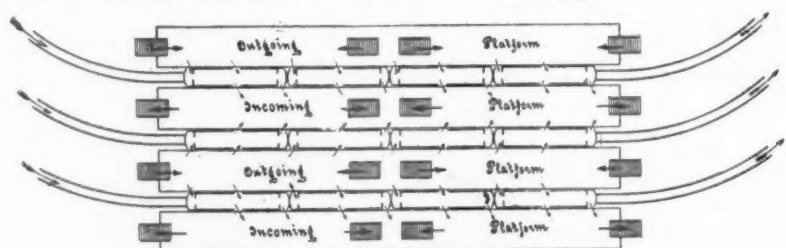


FIG. 10.—PLAN OF STATION PLATFORMS SHOWING MOVEMENT OF PASSENGERS FROM AND TO THE CARS.

Scale, 80 ft. to 1 in.

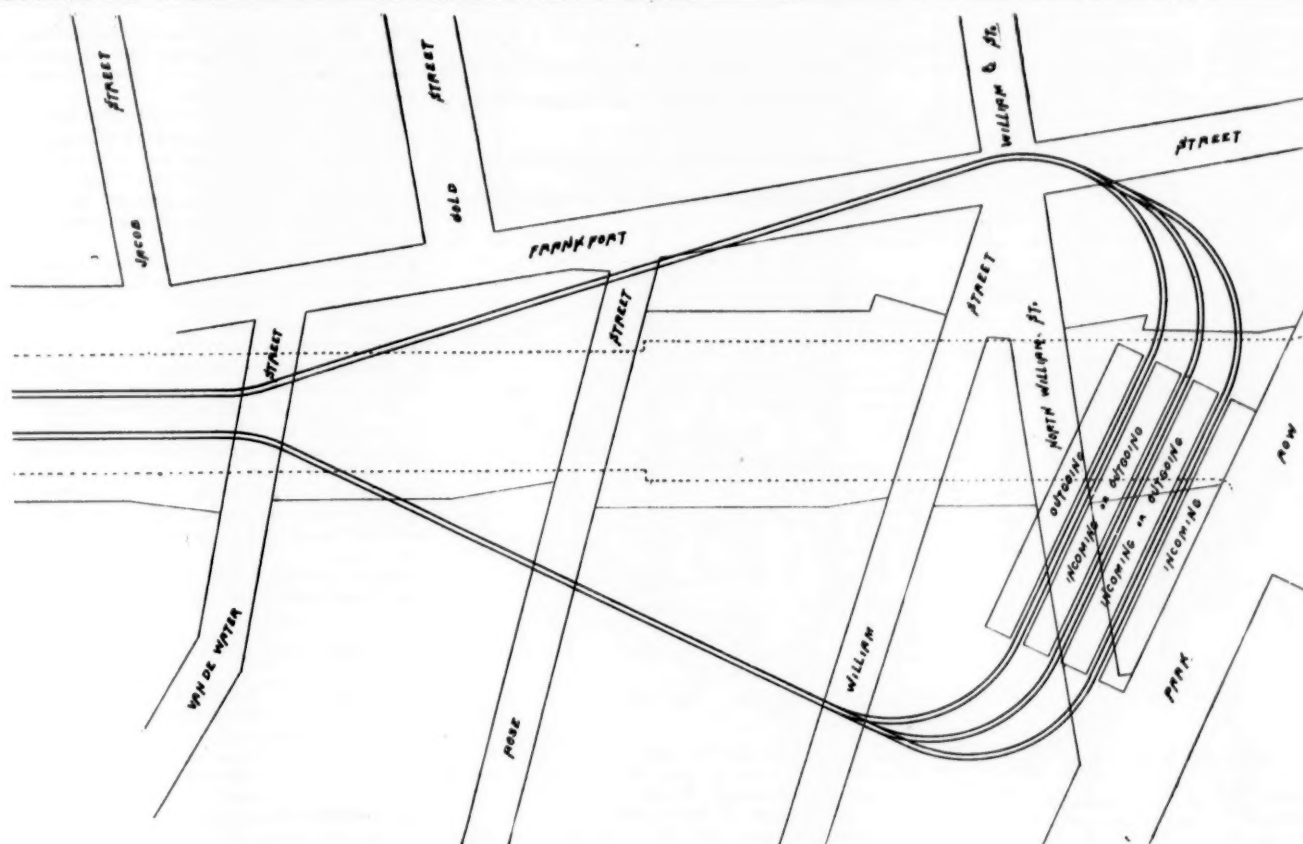


FIG. 7.—PROPOSED NEW YORK TERMINAL, NEW YORK & BROOKLYN BRIDGE RAILWAY.

Scale, 120 ft. to 1 in.

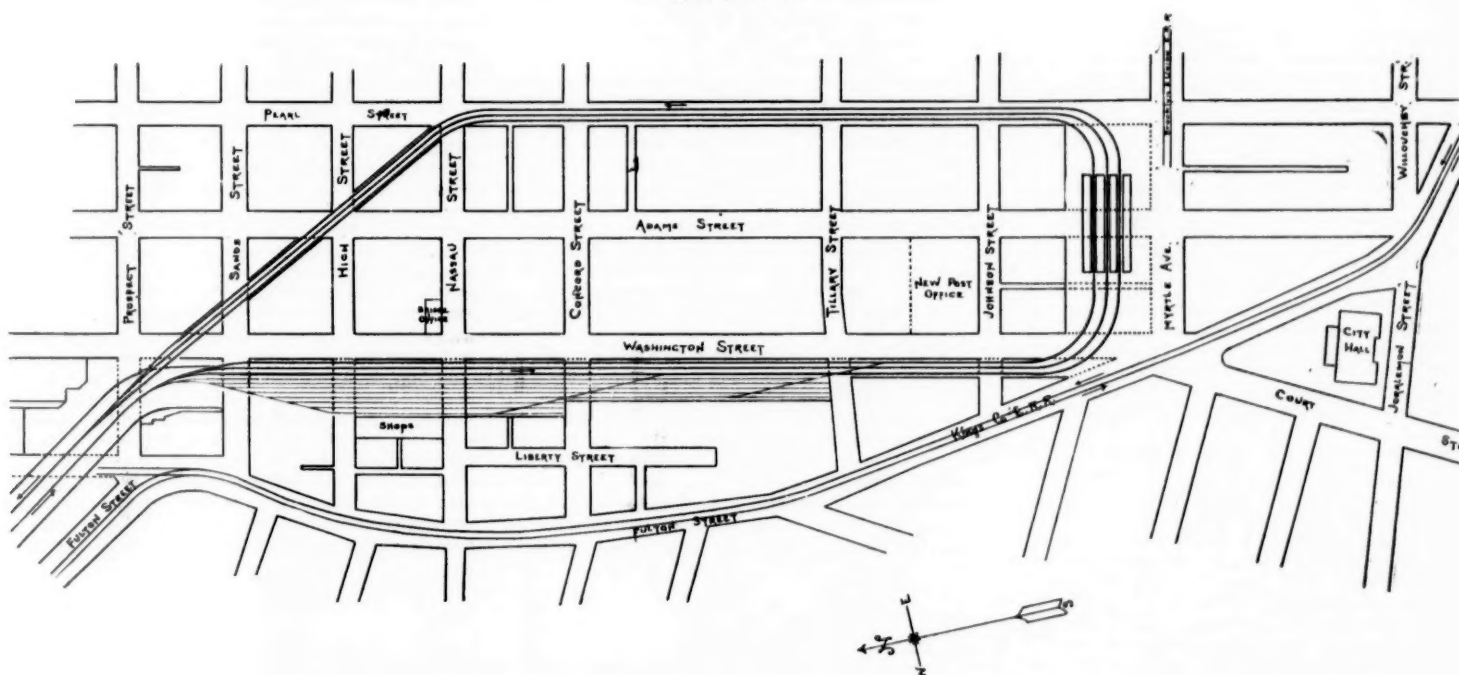


FIG. 8.—PROPOSED BROOKLYN TERMINAL, NEW YORK & BROOKLYN BRIDGE RAILWAY.

Scale, 400 ft. to 1 in.

or part of the system to be operated as the traffic offering may demand, and in case a single part becomes disabled from any cause, the remaining one-half or two-thirds of the system may still be used as before.

Plan Proposed.—Mr. Leverich reviews the plans heretofore adopted and then develops his own plan at considerable length.

Assuming that the designs heretofore adopted exhaust the capacity of terminal stations arranged on the double slip system with forked transfer switches, studies have been made of other and different designs, of which, that shown in outline, fig. 6, was selected as comprising most that was desirable in the plan for such a station. It embodies a modification of the triple slip system with transfer loops, shown in outline, fig. 5; the loops being separated at the outer ends and joined by tangents, which form the branches of the main lines; and along these branches are placed the passenger platforms; the arrangement allowing the station to be located close to and along the street.

The plan proposed for the New York terminal is shown, fig. 7, and that for the Brooklyn terminal, fig. 8. They are located, each in an open space, and are surrounded by streets; that in New York being on the southerly side of Park Row, easterly of Frankfort street, and with passages for vehicles and pedestrians connecting with William street; and that for Brooklyn terminal station, on the northerly side of Myrtle avenue, centrally over Adams street and between Washington and Pearl streets; a way station in Brooklyn may be located near the one now used. The main lines in Brooklyn from and beyond the bridge entrance on Sands street are separated, the incoming lines being continued southward along the westerly side of Washington street to

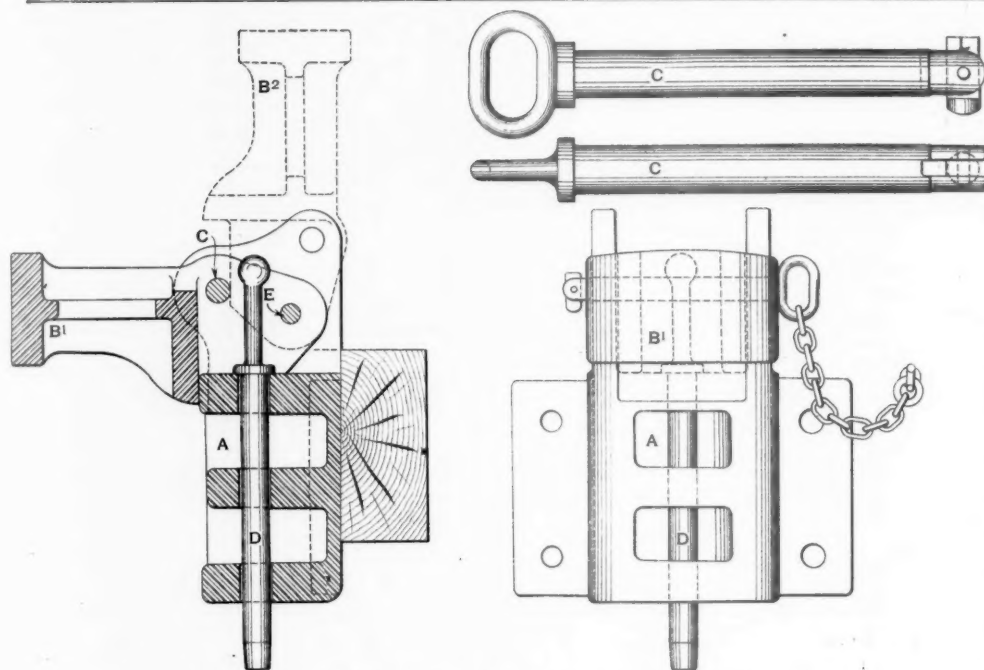
the curves entering the station, and the outgoing lines from the curves leaving the station, northerly over Pearl street to the intersection with Nassau street, and thence diagonally across the blocks and streets to the bridge entrance.

The buildings for the terminal stations, as designed, are similar in plan and arrangement: each is 320 ft. long and 130 ft. wide; the ground floor, the second floor and a part of the third floor are devoted to the uses of the bridge railroad and of the connecting elevated and surface railroads; the remaining floors—of which there are seven in New York, exclusive of those in the towers, and eight in Brooklyn—are set apart for such purposes as will ensure the largest income from rentals; the intent being that these buildings shall, independently of their public service, yield a fair annual return on their cost, including that of the land they occupy. The arrangements for this service in each are essentially alike, and a description of a part used for a station in the building in New York will apply, except as noted, to that in the building in Brooklyn. On the ground floor is one large waiting room for passengers to and from the street, two suites of retiring rooms and two booths for the sale of tickets; on the second floor are the three branch tracks, 30 ft. apart between centres, and four passenger platforms, each 225 ft. long and 20 ft. wide; and on the third floor is one large waiting room for passengers to and from the connecting elevated railroads, a suite of retiring rooms and two booths for the sale of tickets. Downward from each platform to the street floor are four stairways, two in the centre and one at each end, and upward in the centre to the elevated railroad floor, in Brooklyn stations are two stairways, and in New York station is one stairway from each plat-

form, except the outer, from which a direct passage leads to the elevated railroad. All stairways are eight feet wide.

The manner of running the trains into the stations, the use of the passenger platforms and the movement of passengers are illustrated by fig. 9, showing the three separate circuits, A, B, C, and the stations with their platforms; and fig. 10, showing the trains discharging and receiving passengers and the direction of movement. Generally, the incoming and outgoing platforms will be as designated, fig. 10, and as "Ordinary," fig. 9. On special occasions, when the travel is large and much the greatest in one direction, and sometimes, perhaps during the busy hours, morning and evening, by opening or closing gates at the entrances to the stairways, on the street floor, the common use of the two central platforms at the stations may be changed; so that for instance, as indicated fig. 9, during the morning hour there will be in use at Brooklyn station three outgoing and one incoming platforms, and at the New York station three incoming and one outgoing platforms; at each station there are to receive and discharge passengers, when the three tracks are used, four platforms together 80 ft. wide, 16 stairways downward to the street floor together 128 ft. wide, and in the Brooklyn station eight stairways upward to the elevated railroad floor together 64 ft. wide.

When the bridge railroad is operated up to its maximum capacity, as herein described, a train will make a round trip in about 23 minutes, there will 54 trains of four cars each in use, or 18 trains on each of the three circuits; and the headway between trains on the main lines will be 25 seconds. By ceasing to operate one or two circuits, the time the trains remain at the platforms



HEINTZELMAN'S TENDER DRAWHEAD. WITH MOVABLE BUFFER.

being unchanged, the capacity will be reduced one-third or two-thirds, and the headways between trains on the main lines will be increased to 37½ seconds, or to 1 minute 15 seconds respectively. If desirable from the diminution of traffic, these headways may be increased while operating all or part of the circuits. To thus lessen the number of trains running, as the hourly traffic demands, the trains on a circuit to be cut out may be left standing on the separated main tracks of that circuit, between the bridge entrance and the Brooklyn terminal station ready for movement whenever that circuit is again to be operated. Thus generally, whenever the variation of traffic during the day requires it, the number of trains to be moved may be reduced or increased one-third, two-thirds, or more, without switching or hauling the trains from or to the main lines. For reserve and disabled cars, a storage yard in Brooklyn, located as shown, fig. 8, outside of the loops and extending from the bridge entrance, southerly parallel to Washington street, is designed with transfer switches and tracks so arranged that cars to and from the yard need not in any case be moved from or to the main lines, in face of the regular passenger trains.

Elaborate drawings of the floor plans and elevations of the proposed stations accompany the pamphlet.

Heintzelman's Tender Drawhead with Movable Buffer.

The drawhead with movable buffer shown herewith is so clearly represented in the engravings as to scarcely call for description. A is the drawhead and B is the buffer in position for use; and B' when turned up out of the way. This pivots on E and is held in either position by the pin C. The pin is held by L. D represents the coupling pin.

This construction was designed and is patented by Mr. T. W. Heintzelman, Master Mechanic Southern Pacific, Sacramento, Cal., who will give any desired information about it and grant rights to use it. Concerning it he writes: "You will readily see the advantage gained by its use in coupling to passenger and freight cars as compared with using the rigid buffer casting, which always necessitates using a drawbar of sufficient length to clear the dead woods or the ends of the cars. This drawbar, or long link, oftentimes bends so as to allow the buffer to jam into the end of the car, causing damage. On the other hand, in using the plain freight draw casting to couple the Miller hook or other passenger drawbar, without having the buffer to relieve the inward pressure on the drawhook while handling passenger train cars, the result is generally known to be damaging to the equipment.

"The extra cost of this device above the common pattern of castings is the drilling of the three pinholes for the pins C and E, and making the pins, which are put in as they come from the forge, and drilling the small pinholes in the end of each."

Stayless Locomotive Boilers.

At a meeting of the Verein für Eisenbahnkunde, Berlin, held last December, Mr. G. Lentz described in much detail a system which he has developed for constructing locomotive boilers without stays. He showed designs for a variety of service. We reproduce two of them from Glaser's *Annalen*.

Fig. 1 shows the design for a standard freight locomotive for the Prussian state railroads. As seen from the sketch, the front water space with its large flat surfaces and many staybolts is entirely done away with. About the middle of the length of the boiler, where the greatest evaporation takes place, the shell is the highest, and the steam dome is located here where the steam is the driest. The boiler is not so large in the centre but that the engineer and fireman can easily see over it. The front is made of a cast iron plate, provided with an air circulation and covered with non-conducting material.

Mr. Lentz says that at first sight it might seem to many, as it did to him, that as soon as subjected to internal pressure this curved boiler would have a tendency to straighten out, similarly to the tube of a Bourdon gauge, and that in consequence the circular seams would be considerably strained. Further consideration will show that this is not the case, however. The spring tube in the Bourdon gauge is oval in section and not circular, as is the boiler. Practical proofs are not wanting to show that this tendency to straighten out does not exist. For instance, the coils of pipe used in ice-machines—coils about 19 to 60 in. in diameter, of pipe 1 to 2 in. in diameter—when subjected to an internal pressure of 1,200 lbs. to the square inch, do not show the least tendency to straighten out, though they can be sprung easily with the hand. Or another more common example, two sections of a steam pipe connected by a right-angled elbow. No one would imagine for a moment, that as soon as the steam pressure is put on, there is any tendency towards the straightening out of the pipe into a straight line, and the rupture of the elbow. And this being the case, how should this tendency to straighten out exist in the boiler, which is only very slightly curved longitudinally?

The characteristic peculiarity of this boiler consists in its tapering ends, the section of which is at every point circular, and in its circular corrugated firebox, by means of which freedom of expansion is obtained and longitudinal bracing is done away with. A small dome is provided near the front end of the boilers for convenience in attaching the mountings.

The corrugated firebox is inclined and ashes fall upon the inclined bottom plate, and from this into the ash box. The firebox is supported from below or from the

shell. By the construction all staying and stay bolts are done away with, and the cost thereby considerably reduced. The ordinary Prussian freight locomotive boiler contains about 445 staybolts.

The combustion chamber can be arranged in various ways, and fig. 1 shows it provided with an opening for the removal of the cinders and combined with a mud drum. The opening for the removal of the cinders can be made large enough in diameter to serve as a man-hole for entrance into the firebox back of the bridge wall.

Mr. Lentz showed sketches of several other boilers of the same style, and pointed out their advantages over the ordinary firebox boiler, so far as the freedom in arranging the positions of the axes to obtain an equal loading of them is concerned.

The good points of this system of construction, according to the author of the paper, are as follows:

The first cost is reduced \$1,000 to \$1,250; the cost for repairs is greatly reduced; the working pressure can be increased; the better combustion makes a saving in fuel the firebox remains clear and the evaporation is better; the firebox and tubes can easily be renewed; the boiler being plain, exteriorly, i. e., without a square projecting firebox, the axes can be better arranged on new locomotives.

Fig. 2 shows a design for an express locomotive for the Prussian State railroads.

Accounting Officers' Recommendations.

Secretary C. G. Phillips, of the Association of American Railway Accounting Officers, has issued a circular to members giving a summary of the recommendations passed by the meeting of the association at New Orleans Jan. 22 last. The topics embraced are: 1. Information to be given on each coupon of inter-road tickets. Each coupon should show the whole route, and where feeders are used the information should appear on both feeder and ticket. It is desirable to present this subject to the General Passenger Agents' Association. 2. Method of accounting for exchange orders. Tickets issued in exchange should be shown in regular report, without revenue, and a separate statement of the value of orders should be made. A standard blank is given in the appendix to the circular. 3. The Association also approved of standard blanks for report of coupon ticket sales, claim for correct proportions and claim for unreported tickets. Samples of these are given. 4. The Association recommends that connections be notified by telegraph of stolen or counterfeit tickets, and the notice confirmed by mail. 5. Excess baggage collections should be reported separate from coupon ticket sales, but the total of the baggage should be added to the ticket report. 6. Revenue for coupon ticket sales should be reported in gross, and payment for commission or other purposes should not affect the divisions. 7. Where deductions are made for tickets redeemed the tickets should accompany the report. 8. Where a claim is made for an unreported ticket or coupon the ticket should be sent as a voucher. 9. A uniform bill of lading is desirable, but conference with officers of other departments will be necessary. 10. Way-bill corrections should not be made where the error is five cents or less, but errors affecting the settlement of balances should be corrected, however small. 11. Old material should be credited to the account directly affected, at a fair market value, and debited to material stock account until sold or charged to another department. 12. It is the sense of the Association.

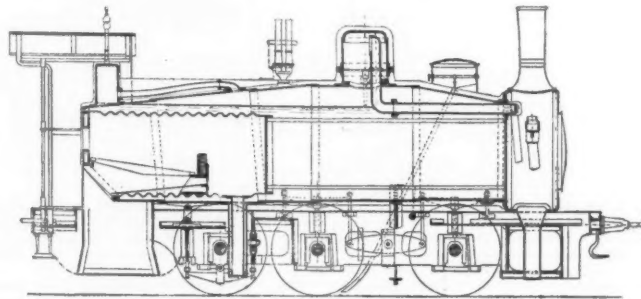


Fig. 1.—Locomotive for Freight Service.

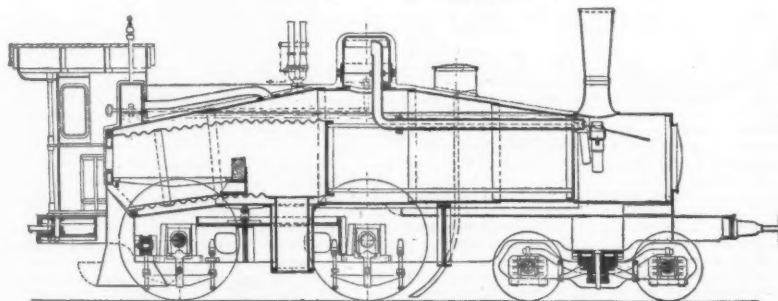


Fig. 2.—Locomotive for Express Service.

LOCOMOTIVE BOILERS WITHOUT STAYS.

DESIGNED FOR THE PRUSSIAN STATE RAILROADS.

ciation that renewals of equipment and track should be kept separate from ordinary repairs, but charged to operating expenses. 13. Precise definitions are given to the terms "current assets" and "current liabilities," the latter to be used where "floating debt" is customarily employed.

The Association recommends that the liability side of the balance sheet be expressed as follows: (a) Capital Stock. To include common and preferred stock. (b) Funded Debt. To include all liabilities of the company which are secured by mortgage or otherwise funded. (c) Trust Accounts. To include sinking funds and other trust liabilities. (d) Current Liabilities. To include all other liabilities of the company which usually represent accounts payable, either due or to become due. (e) Profit and Loss. To include a balance of that account when it represents a surplus.

The asset side of the balance sheet to be expressed as follows: (f) Road and equipment. To include the cost of the road as shown by construction, with cost of equipment or value of the equipment, as it may be stated in the account. (g) Investments. To include stocks or bonds owned by the company and funds otherwise invested but still under the control of the directors or officers of the company, and material on hand. (h) Trust accounts. To include the asset claims against trustees under mortgages, sinking fund or other trust claims. (i) Cash and current assets. To include the cash on hand, bills receivable and other asset accounts which are convertible into money or can be used in the future operation of the property at the discretion of the directors or officers of the company. (j) Profit and Loss. To include the balance of that account when a deficit exists.

Reports of State Railroad Commissions.

MASSACHUSETTS.

The full report for the calendar year 1889 has just been issued. The main body of the report was noticed in the *Railroad Gazette* for Feb. 21. The appendix contains reports of the special investigations made by the board during the year, the usual reports from the companies, with summaries; information received in answer to inquiries concerning heating cars by locomotive, including that collected by Secretary C. A. Hammond, of the Superintendents' Association, which was reported in the *Railroad Gazette* of April 12 last; a consolidated draft of laws relating to the separation of grades at existing grade crossings, and matter relating to the danger from unbraked wheels in heavy trains, which was drawn out by the collision at Springfield, April 26. This case was described in the *Railroad Gazette* of Aug. 30 last.

Thirteen grade crossings of highways have been abolished during the year. Of these five were on the abandoned line of the Boston, Winthrop & Shore, and the other eight were on the Boston & Albany, Old Colony and Fitchburg. The Grafton & Upton, which is now under construction, and is to have 17 grade crossings, got leave to establish them by securing the passage of a special law, the Commissioners having taken no action on their application for permission from the Board under the general railroad law.

In December last the Board made inquiries of the roads concerning the number of brakemen on freight trains, the minimum distance of bridge abutments, buildings, etc., from the rail, the number of facing points on double track main line and the block system. We summarize portions of the replies.

Number of Brakemen.—Boston & Albany—Boston to Worcester, 35 cars, 4 men; Worcester to Springfield, 26 cars, 2 men; 32 cars, 3 men. New London Northern—Some trains with only two men. New York, New Haven & Hartford—As many as may be necessary, from 3 to 6. On most of the other roads 3 brakemen are employed.

Facing-Point Switches, and Block and Station Signals.—Boston & Albany, 200 miles, 100 switches. Protected by interlocking signals, 32; by automatic electric signals, 43; by switch targets only, 23. All of the latter are in large yards and 16 of them will soon be protected. Union electric automatic track circuit clockwork signals are provided at nearly every station west of Worcester. The Hall automatic signal is used at all stations between Riverside and Worcester, and the road is continuously blocked by the Union (clockwork) system east of Riverside on both the main line and Brookline Branch.

The Connecticut River road has 23 facing-point switches, of which five are protected by various devices, and has three miles of double track equipped with the Union (clockwork) system. The Fitchburg has 116 facing-point switches, of which 11 are protected by interlocking, 20 by ball signals and 29 by automatic electric signals. The Union (clockwork) signals are used on 11½ miles of double track; 10½ miles of the south main track west of Fitchburg is equipped with the Union track circuit (pneumatic) system. Nine stations, other than those included in these 22 miles, are protected by automatic clockwork signals. The New York & New England has the Union (clockwork) system from Boston to Winslow, 15 miles. It has 30 facing-point switches in double track, four of which are protected by semaphores. The New York, New Haven & Hartford has 108 facing-points on 122 miles of double track. The only protection specified is the "safety switch house," which is so arranged that when the switch stands for the side track the attendant is compelled to remain inside the switch house. There are a number of interlocking towers, but it is not stated how many. The regular block system is used for 60 miles and Hall's electric signals are used at numerous stations, yards and obscure points.

The Providence & Worcester division of the New York, Providence & Boston has (on 44 miles) 50 facing-point switches, of which 47 are protected by Union (clockwork) signals and the other three by ball signals. The Union (clockwork) system is in use continuously for the first 7½ miles from Providence.

The Old Colony has 88 facing points, of which 20 are protected by interlocking, 18 by electric signals, and 22 by ball signals. It has 111 miles of track equipped with the Union (clockwork) system. There are 37 automatic station signals, most of them being electric; about 10 of these are pneumatic, but the exact number is not stated.

The Boston & Maine has 292 facing-point switches, of which 25 are protected by interlocking and 15 by ball signals. The Hall signal is used between Boston and Salem, the Union (clockwork) between Salem and North Beverly, and between Boston and Somerville. The Hall signals here referred to are of the old pattern, erected about 1872. Outside of these sections eight stations have the Union (clockwork), four have Gould-Tisdale signals, and two Hall signals.

We append an extract from the Commissioners' report which was omitted from our summary printed Feb. 21:

The Uniform Code.—Lack of uniformity on different roads in rules governing the train service is a definite source of danger, which has long been recognized by railroad men; and in 1887 a code of rules was adopted by the General Time Convention, a body at that time comprising a membership of 164 railroad companies, represented usually by their general manager or their general superintendent. This code was prepared with great care, and was discussed and perfected by the combined experience of many experts. The object of the code was to secure uniformity, a correct and pointed expression, and the best practice. Some of our roads have adopted this code as the basis of their rules, while others neglect to do so. The code may not be perfect; undoubtedly it will be improved from time to time; but, even if it is not more perfect than the existing rules of any special road, still the argument in favor of its adoption is of conclusive force. There is danger at the time when the change is made; but that danger can be, and has been, by many roads, effectually guarded against. The danger is temporary; the time of its occurrence is fixed by the management to suit its convenience, and all necessary precautions can be taken. It is a surgical operation which is expedient, in order to eradicate what would otherwise be a permanent and serious disease. With different codes on different roads there is danger whenever an employee in the train service goes from one road to another. This trouble is constant and ill-defined, and cannot be properly guarded against. No person can watch the lack of uniformity in methods of giving hand signals by day or lantern signals by night, by the conductors and brakemen on various roads, without wondering why more frequent disaster has not resulted. On the Boston & Maine Railroad the hand signal for stopping is similar to, and hardly distinguishable from, the standard code signal for starting.

By variety of practice the difficulty of securing safe operation is greatly increased, whenever, in consequence of a strike or for other reason, an extensive change of employees is rendered necessary. The neglect of some roads to adopt the standard code is unfortunately not only a source of danger to themselves, but remains a constant menace to those roads which have adopted the code; since they, too, in changing employees, may get men coming from roads on which the practice has not been in accordance with the Time Convention's code.

Uniformity in the numbering of rules, as well as in phraseology, is of great value both as a means for facilitating reference and of diminishing the chances of misunderstanding.

If there is uniformity in rules employees will be benefited, because experience on one road will then be a qualification for, rather than a bar to, equally responsible employment on another.

For the sake of promoting the safety of travel on all roads, and for the benefit of others as well as for their own benefit, we urge those roads which have not yet adopted the Time Convention's code as the basis of their rules to do so without unnecessary delay.

The Time Convention's code is prefaced by a general notice, from which the following is an extract:

It is of the utmost importance that proper rules for the government of the employees of a railroad company should be literally and absolutely enforced, in order to make such rules efficient. If they cannot or ought not to be enforced, they ought not to exist. Officers or employees whose duty it may be to make or enforce rules should keep this clearly in mind. If, in the judgment of any one whose duty it is to enforce a rule, such rule cannot or ought not to be enforced, he should at once bring it to the attention of those in authority.

The foregoing is a forcible and correct statement. Its urgency cannot be too often suggested. During the past year the Board has, on several occasions, called the attention of officials to cases in which rules have not been "literally and absolutely" complied with. On one road which had adopted the standard code, it was found that some of the employees were still giving the signals in accordance with by-gone practice. In another case a telegraphic message was sent, not as the rules required, but in a form which the operator considered meant the same thing. If harmless deviations from rules are not condemned, corrected and uprooted, they will prove to be the seed from which harmful deviations will grow. The management which knowingly permits a rule to be violated without punishment or reproof, thereby becomes responsible in part for disasters which may result from similar violations of other rules.

CALIFORNIA.

The report for the calendar year 1889 has been issued by Commissioners A. Abbott, P. J. White and James W. Rea. Twenty-four companies report, of which nine are 3-ft. gauge roads. The statistics, which are entered as "for the year 1888," aggregate as follows: Length of road in California, 3,987 miles; increase over previous year, 545 miles; capital stock, \$287,208,720; funded debt, \$139,464,110; gross earnings, \$40,374,208; operating expenses, \$27,165,865; net earnings, \$13,446,607. Tables are given showing percentage of expenses on each road, gross and net earnings per mile, percentage of net income to cost, percentage of net income to gross income, and average rates of fare and freight on different roads. The number of overland passengers in the nine months ending Oct. 1, 1889, was 57,217 eastward and 68,520 westward. There are also comparisons of passenger rates between California roads and roads in the vicinity of Chicago; wages received by different classes of employees, and other matter. The highest price paid for coal by any road was \$12.55 per ton by the North Pacific Coast. The Pacific Coast Railway Co. paid \$5.33 per cord for wood. The Atlantic & Pacific purchased coal

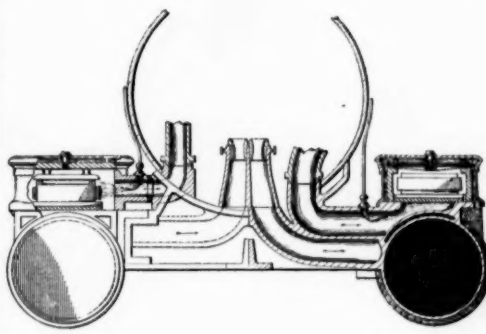
at \$1.81 per ton, and wood at \$1 per cord. There are in the state 1,301 wooden bridges, 36 iron bridges, 73½ miles of trestles, and 76 tunnels aggregating 11 miles. In the year 1888 175 persons were killed and 838 injured, these figures being 30 per cent. and 33 per cent., respectively, higher than those for 1887.

The report gives a brief history and description of each road. This matter and most of the tables referred to appear now for the first time. The commissioners think the fourth section of the Interstate Commerce law is prejudicial to the interests of California, and they hope it will be modified.

Improvement in Valve and Cylinder Lubrication.

The cut herewith shows an improvement recently brought out by the Detroit Lubricator Co. in the method of connecting the tallow pipes for lubrication of locomotive valves. The illustration shows two locomotive cylinders and their steam chests, one side representing a balance slide valve and the other an old-fashioned T valve. A detail drawing of the connection will be furnished to master mechanics using the Detroit lubricators to enable them to test the improvement.

This method is used only in connection with the Detroit improved locomotive lubricators, and consists in



changing the discharge end of the tallow pipe from the top of the steam chests to the extreme end of the main steam pipe. By this change, it is claimed, the back pressure is greatly lessened, and the oil is carried by the force of the steam directly to the wearing parts of the valves and cylinders, thus securing a constant supply of oil under all variations of the throttle.

Besides the improved results from the direct application of the oil to the parts to be lubricated, the saving of oil is said to be large, as under the old method of delivering the oil into the top of the steam chest, where balance valves are used, a considerable amount of oil is wasted upon the sides and bottom of the steam chest before reaching the valve seats.

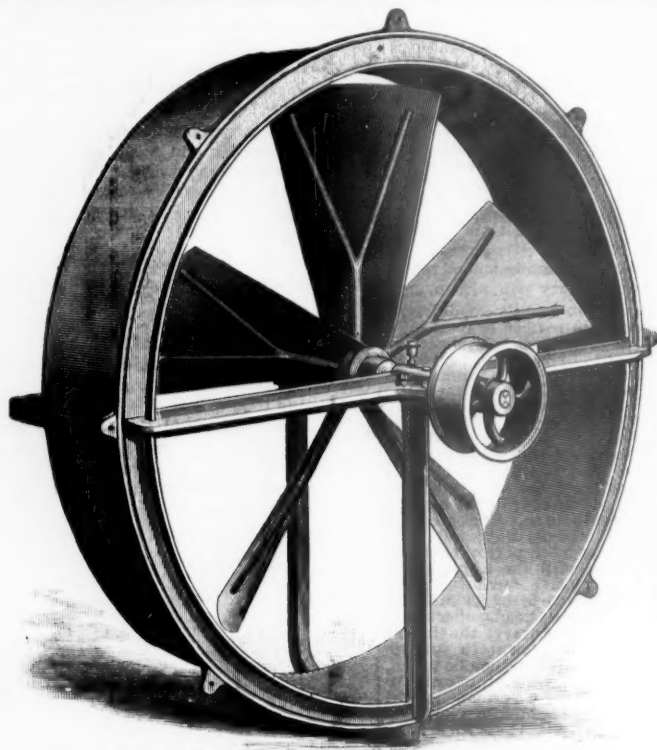
The Mississippi Floods.

The Mississippi River is outdoing itself this spring in breaking through its levees and flooding the adjoining lowlands, the high water having now continued over a month. The loss of life has been low, but it would be a matter of the roughest guesswork to attempt an estimate of the loss of property. This loss, or rather these losses, do not fall heavily upon large corporations, as a rule, but are confined, for the most part, to individuals and small proprietors, living or doing business along the banks of the stream. Engineers are busy attempting to stop the crevasses, but in many cases their efforts have been futile. The method that has given the best satisfaction and which has been most generally employed is to build a V-shaped crib back of the opening, and then choke off the flow of water by filling in with sacks of earth until the front of the levee is reached.

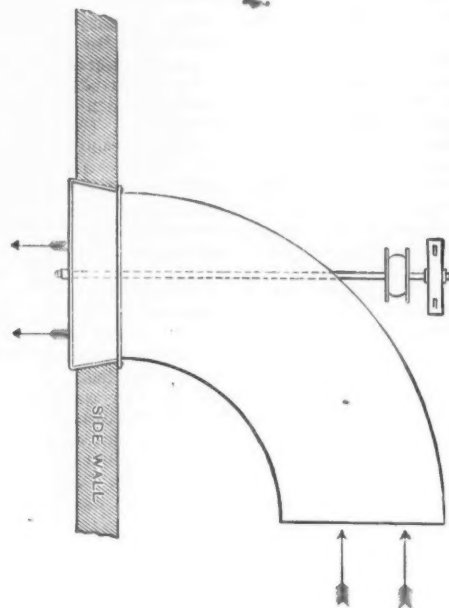
But when a crevasse has opened to the width of from 600 to 800 ft. and attained a depth of from 10 to 15 ft., with the water rushing through like a torrent into the open fields, the difficulties of the task may be readily appreciated. Smaller openings can be closed, but the best that can be done with these great gaps is to protect the ends of the levees and prevent further destruction.

In all this desolation, the loss to the railroads, in actual destruction of property, has been comparatively slight. The reason is that there are no trunk lines skirting the banks of the Mississippi. The Louisville, New Orleans & Texas, running from Memphis to New Orleans, only touches the river once (at Vicksburg), between Memphis and Baton Rouge. From the latter point it runs in close proximity to the river to New Orleans. This is the only through line parallel to the river, and this is at some points 25 miles from the stream; for the Mississippi is very crooked, while the railroad takes the shorter cut of a direct line.

The greatest railroad sufferer by the flood seems to be the New Orleans & Gulf, running from New Orleans through Plaquemine Parish to the Gulf. At this point there had, heretofore, been but little trouble from the floods, for the waters have been relieved by the bayous from above. This year, however, a break at Jesuits Bend flooded the tracks and caused the road to suspend operations. The first trunk line to be affected was the Vicksburg, Shreveport & Pacific, whose tracks were flooded,



Perspective View.



Sectional View, in Position.

DISK WHEEL FOR VENTILATION.

Made by the BUFFALO FORGE CO., Buffalo, N. Y.

not by the waters direct from the river, but by the overflow of back water through the Tensas River some 25 miles west of Vicksburg. The current has not done any very great damage, though the water has reached a depth that precludes the running of trains. Arkansas City has been cut off by the flooding of the rails of the St. Louis, Iron Mountain & Southern, but this does not affect what is properly called through travel. Greenville, Miss., has been isolated by the submergence of the Riverside division of the Louisville, New Orleans & Texas, and it is several days since any trains have been run. The main line of the road, however, has been undisturbed, and traffic was uninterrupted until April 1, when the breakage at Austin and Tunica, some 40 miles south of Memphis, rendered it impossible to run through trains.

While, at the present writing, the flood shows no signs of subsidence, it is not at all probable that there will be any further very serious damage to railroad property, and it will be necessary to await the settling of the waters before even an approximate estimate can be formed of the destruction of private property, or of the hundreds of people who have been rendered homeless and are now shivering upon the levees.

Ventilation by Disk Wheels.

The proper ventilation of workshops and other buildings is more often neglected than one would suppose, considering its practical importance. Many people have a very inadequate idea of the importance of an abundant supply of pure and fresh air, and its effect upon the health and efficiency of those breathing it. It has been clearly demonstrated that all methods that depend in a greater or less degree upon natural draught for movement of air are more or less affected by atmospheric changes, and in consequence a certain amount of air regularly supplied in a given time without reference to outside conditions of the weather cannot be relied upon, such systems often being rendered practically dormant by some of these conditions. The general conclusion is, that satisfactory and regular ventilation at all times can be secured only by a mechanical movement of the air, by which a given quantity of it is changed in given time, regardless of atmospheric conditions.

The disk wheel is often found to be a convenient and efficient means of accomplishing this end, and our illustrations show such a wheel, as made by the Buffalo Forge Co., Buffalo, N. Y. This wheel has been recently improved by the builders, and among their claims for it are ample capacity to handle large volumes of air at small expense of power and perfectly noiseless operation, adapting it to use in a large number of places where noise could not be tolerated; while it is of handy form and light, and fitted with a self-oiling device which permits the wheel to be left without attention for long periods of time.

A disk wheel is very convenient for use with pipe connection for direct work in removing smoke and gases from forge fires. In the application of an exhaust disk wheel where piping is necessary, the wheel is always placed as near the work to be accomplished as possible, with large branch pipes and main pipe of full diameter of wheel. The branch pipes are made with

telescopic joints to admit of being raised up out of the way. Smoke, gases or steam can always be more easily and effectively removed by being taken immediately into pipes at the points where they are generated, and conveyed to exhaust wheel, than if permitted to expand into an open space or room, and thence carried off.

The general sizes of the disk wheels range from 18 in. to 84 in. in diameter, though it is possible to make larger ones for special requirements, and something of an idea of the amount of air which may be removed by the different sizes at a given velocity may be obtained by noting that a 24 in. wheel at 300 revolutions per minute exhausts 1,864 cu. ft.

Protecting Tracks from Snow Storms.

We condense from the *Northwestern Railroader* a paper by James Manning, Roadmaster of the Chicago, St. Paul, Minneapolis & Omaha, read at the last meeting of the Northwestern Track and Bridge Association in St. Paul, and the discussion on the same.

Mr. MANNING discussed fences chiefly. He regarded 100 ft. about the proper distance to locate the permanent fence from the track. At bad cuts on the windward side there should be a second permanent fence 100 ft. further back, and a portable fence should be provided for use on top of snow as soon as it has drifted even with the tops of the main fences. Permanent fences should be about 8 ft. high. Willow trees, in rows 8 ft. apart, the nearest row 100 ft. from the track, afford a good protection. Three or four rows should be planted. Board gates, cattle-guard wings, grass, old material, etc., should be carefully cleared off or burned, as a small obstruction of this kind will develop a bad snow cut in the course of a winter. The roadmaster should constantly aim at getting rid of his light cuts, using the earth to fill in the low places and trestles. Shallow cuts make the most trouble. In building a new road it is better to have a few light sags than too many cuts. For permanent fences Mr. Manning sets his posts well into the ground and ties them together securely by 2 in. x 6 in. x 16 ft. strips. For a temporary fence, to use on top of drifts, he uses eight pieces 1 in. x 6 in. x 16 ft., tied together at both ends by pieces 2 in. x 4 in. x 8 ft. There are two braces to each panel, 2 in. x 4 in. x 16 ft.

Mr. NASH, of the Minneapolis, St. Paul & Sault Ste. Marie, thought 100 ft. too far away, and had found a distance of 60 ft. to give the best results. Mr. DUNN, of the Minneapolis, Lyndale & Minnetonka, thought 200 ft. the proper distance. In an experience of 13 years he had tried a variety of distances. At large cuts he had the fence 100 ft. from the track. The fence should not be tight, but have one inch openings between the boards.

Mr. McMILLAN agreed with Mr. Manning, but thought that the minimum distance should be variable, different cuts requiring different treatment. Where possible, cuts should be widened to 70 ft., and excavated 1 ft. below the roadbed on both sides. This would make most cuts snowproof.

Mr. BAUMAN, of the Great Northern, had lately sloped off some of the smaller cuts with good results, the snow blowing across. Cuts 5 ft. deep were sloped back 30 or 40 ft. The President had tried sloping, but with poor results. Mr. COPELAND, of the Chicago, St. Paul, Minneapolis & Omaha, found a cornfield the best snow fence.

Breakage of a Cable on the Brooklyn Bridge.

About 6 o'clock p. m. Monday, March 31, the hauling cable on the Brooklyn Bridge railroad broke in two at a point on the track to Brooklyn about 500 feet from that station. At this hour the traffic is generally the largest during the day, and at this time it was, in consequence of

bad weather, unusually great. Trains were running on 1½ minutes' headway and were crowded.

A grip on the train nearest Brooklyn station had failed, and as a precautionary measure the train had been stopped near where the break occurred. The two following trains were flagged, and when they stopped the cable broke, doubtless from an extra stress imposed on it thereby. The driving engine was at once stopped, and no injury was done to any part of the cable plant. The outgoing line of cable was looped somewhat at the tension car, also the line on the New York slope of the Brooklyn track.

The tracks were promptly cleared and trains were run by locomotives until 12 p. m. sharp. Meantime the broken cable was laid aside, and the duplicate cable was put in place for service Tuesday morning. The driving plant is in duplicate, and two cables are kept wound on the drums ready for use.

This is the third in order of the cables employed, and the first one broken. It was worn out. The break was fair, the section parted not being a yard long. The cables are inspected at the splices every night, and thorough examinations of other parts, or the whole length, as may seem necessary, are made once a week. The cables are of steel wire, 1½ in. in diameter, laid up in six strands of 19 wires each, about a hempen core. When new they were 1½ in. in diameter, which, by wear and compression of the core, is reduced to nearly 1¼ in.

The record of some of these cables is appended. The average load hauled has increased from 74 to 250 tons. For comparison, it may be remarked that a cable on a street railroad, doing much less work, runs nearly 100,000 miles.

BROOKLYN BRIDGE CABLE SERVICE TO MARCH 31, 1890; CABLES 1, 2, 3 AND 4.

Cable.	Number of days.	Miles hauled.	Cars hauled, tons.	Passengers, tons.	Total tons hauled.	Ton-miles.
1 removed.	1,125	226,273	9,201,468	3,060,060	12,261,468	22,133,653
2 " "	662	128,671	11,909,612	3,246,166	15,155,778	27,911,183
3 " "	440	82,225	9,720,888	2,529,109	12,249,997	22,614,872
4 in use.	199	41,472	4,456,898	1,160,058	5,616,956	10,386,244

The Composition of Boiler Scale.*

The result of an analysis of boiler scale usually represents the lime and magnesia as carbonates with a portion of the former as sulphate—on the general principle that the scale made continues to exist in the form in which it was precipitated. In those portions of the boiler where the direct heat does not come in contact with it, the scale remains unchanged after formation, but the conditions are altered where the scale is subjected to intense heat. In the latter case, while the deposition of the scale-forming material at first occurs as carbonate and sulphate, the gradual heating expels some of the carbonic acid, and the oxides of calcium and magnesium are formed.

That portion of the scale nearest the iron and to the heat loses more of its carbonic acid, and becomes caustic so long as the fire continues. As soon, however, as the fires are drawn, the oxides of calcium and magnesium become hydrated by absorption of water. If now a sample of the scale were taken for analysis, the water of hydration becomes an important factor in the analysis:

A sample of scale from some boilers at Birmingham, *By Thos. B. Stillman in the *Journal of Analytical Chemistry*.

Ala., recently submitted to me for analysis, gave the following result:

Silica and Clay.....	11.70 per cent.
Fe ₂ O ₃ , Al ₂ O ₃	2.81 "
CaO.....	11.62 "
MgO.....	41.32 "
CO ₂	6.92 "
SO ₂	0.96 "
H ₂ O (of hydration).....	21.78 "
H ₂ O (moisture at 212 deg. F.).....	0.60 "
Undetermined.....	0.20 "

Total..... 100.00 "

An examination of this analysis shows an unusually small amount of carbonic and sulphuric acids, a large amount of water and of magnesia. The great excess of the latter over the lime indicates that the water from which the scale was formed is a magnesia water, but its presence in this amount does not in any way alter the conditions of the problem. With less than one per cent. of sulphuric acid and less than seven per cent. of carbonic acid, the oxides of calcium and magnesium could not exist in their entirety as carbonates or sulphates, for combining the above acids to form carbonates and sulphates, the result indicated over 20 per cent. lacking in the 100 parts. The determinations of the carbonic and sulphuric acids were in duplicate and in every way satisfactory, while no organic matter of any amount was indicated in the analysis. The large percentage of the oxides of calcium and magnesium left after combination with the acids suggested water of hydration.

A sample of the scale (dried at 100 deg. C.) was transferred to a platinum crucible and heated over the blast lamp to a constant weight. The loss of weight was over 28 per cent., and, of course, included the carbonic, but not the sulphuric acid. To check this result, a sample of the dried scale was ignited in a combustion tube and the H₂O collected in a weighed chloride of calcium tube. The result was 21.78 per cent. of water of hydration. This satisfied the conditions existing, and the combinations gave as follows:

Silica and Clay.....	11.70 per cent.
Fe ₂ O ₃ , Al ₂ O ₃	2.81 "
CaO.....	1.60 "
CaCO ₃	5.45 "
MgO.....	7.36 "
Ca(OH) ₂	56.37 "
H ₂ O (moisture at 212 deg. F.).....	0.60 "
Undetermined.....	0.20 "

Total..... 99.97 "

A section of the scale was subjected to examination layer by layer, and the following results confirm the above. That portion of the scale next the iron and nearest the fire contained but traces of CO₂, and was principally the hydrated oxides. The middle portion of the scale was a mixture of CO₂ and the hydrated oxides, while the upper portion of the scale contained carbonates, but no hydrated oxides. In other words, the composition of the scale will depend, in a great measure, upon what portion of the boiler the deposit is made. That deposited on iron or shell not in contact with the flame or not subjected to extreme heat, will remain as deposited—as carbonates and sulphates—while that scale deposited upon the iron subject to the flame or heat sufficient to drive out any carbonic acid from the scale, will vary in amounts of CO₂ and water of hydration as indicated. Scale formed in which the lime all exists as calcium sulphate and in which no magnesium carbonate is present, will be subject to but little variation.

TECHNICAL.

Locomotive Building.

The Central of Georgia is to receive next week the first lot of an order for 40 passenger, freight and switching engines. The order is to be completed by July 1.

The San Francisco & North Pacific will soon place an order for three locomotives.

The Atlantic & Danville has recently ordered four new engines.

The Brooks Locomotive Works, of Dunkirk, N. Y., are building 25 engines for the Lake Shore & Michigan Southern.

The Louisville, St. Louis & Texas has ordered two heavy freight engines. A 40-ton locomotive ordered some time ago was received this week.

H. K. Porter & Co., of Pittsburgh, have completed two 24-in. gauge six-ton locomotives, one for a mine in South Carolina, and the other for brick works in New Jersey. The locomotives have 6 x 12 cylinders, and 23-in. driving wheels.

The Schenectady Locomotive Works have an order from the East Tennessee, Virginia & Georgia, which includes two compound locomotives, one for freight and the other for passenger service.

The Chicago, Burlington & Quincy will soon award a contract for building 18 locomotives.

The New York Central & Hudson River road has recently let contracts for building 125 locomotives, the delivery to begin in June and to be completed by Sept. 30. The order includes 50, 19 x 26 mogul freight engines, let to the Rogers Locomotive Works, Paterson, N. J.; 75 locomotives to the Schenectady Locomotive Works, of Schenectady, N. Y., including 21 eight-wheel passenger engines with 19 x 24 cylinders, 25 mogul freight engines with 19 x 26 cylinders, and 29 eight-wheel switching engines with 18 x 24 cylinders. All the freight and passenger engines will be equipped with the American steam driver brake. The order for 25 more engines will be let this week.

Car Notes.

The South Carolina road is in the market for 10 passenger cars.

The Colorado Midland will soon place an order for 20 passenger cars.

The Denver & Rio Grande has recently let contracts for a large number of cars aggregating nearly 3,500.

The Norfolk & Western has placed an order for second-class passenger cars with the Roanoke Machine Works.

The Bloomsburg Car Co., of Bloomsburg, Pa., has received an order for 200 fruit cars from the Iron Car Co. of New York.

The San Francisco & North Pacific will soon award contracts for building 50 platform and a number of other freight cars.

The Pittsburgh Traction Co. is asking bids on 120 passenger cars for the electric street road which it is building at Pittsburgh.

The Wabash has sold 10 box and 10 platform cars to

the Toledo, Findlay & Springfield, and has other cars which it wishes to dispose of.

The Atlanta & Florida last week received two passenger cars and a baggage car, and has ordered other rolling stock which will soon be delivered.

The Buffalo Car Manufacturing Co. is building 200 refrigerator cars for the Lackawanna Line and 200 stock cars for the Delaware, Lackawanna & Western.

The Carlisle Manufacturing Co., of Carlisle, Pa., has received an order for 400 gondola cars and 100 box cars of 60,000 lbs. capacity from the Buffalo, Rochester & Pittsburgh.

The shops of the Wagner Palace Car Co., at East Buffalo, N. Y., are building eight parlor cars for the Central Vermont, two parlor and two sleeping cars for the Shore Line between Boston and New York, and a number of new cars for the Limited trains on the New York Central & Hudson River road and the Lake Shore & Michigan Southern. The company is now employing about 1,000 men at these shops.

Osgood Bradley & Son, of Worcester, Mass., are building eight passenger cars and two combination and baggage cars for the New York, Providence and Boston. The passenger cars are 63 ft. 4 in. long and the combination cars 60 ft. long. The latter seat 54 persons. The interior finish of the cars is in mahogany; the Henry seat and the Baker improved heater are used, the latter arranged to use steam from the locomotive. The cars will have platform girders.

E. H. Wilson & Co., of Philadelphia, proprietors of the Lamokin Car Works, of Chester, Pa., have given an order to the Pullman Car Co. for 136 cars for the Philadelphia & Sea Shore road. Part of the order is to be delivered in June and the balance in August. E. H. Wilson & Co. are at present so crowded with orders that they could not build the cars in the time required. The order includes four parlor cars, 26 passenger, four combination, two baggage and 100 freight cars.

The New York Central & Hudson River road has let a contract for building 2,000 box cars 34 ft. long to the Michigan Car Co., of Detroit. The company has also let a contract for 1,000 box cars to the Buffalo Car Mfg. Co. In addition to these orders 3,000 cars are to be built at the West Albany shops; 2,700 of these latter will be 34 ft. box cars and 300 will be platform cars. All the cars will be equipped with Westinghouse brakes and 3,000 with the Gould coupler and the other 3,000 with the improved Dowling coupler.

The Lake Shore & Michigan Southern has received nearly all the 3,300 freight cars, the contracts for which were placed at intervals last fall. The new equipment consists of 1,000 drop-bottom gondola, 1,500 box, 250 hay and 500 platform cars. As already stated the orders for these cars were placed as follows: Wells & French Co., 1,200; Peninsular Car Co., 1,000; Buffalo Car Manufacturing Co., 100; Indianapolis Car Manufacturing Co., 200; Lafayette Car Works, 400; and Barney & Smith Manufacturing Co., 400. At the Buffalo shops of the company three cabooses and 50 eight-wheel dump cars are being built, and at the Adrian shops two cabooses. In addition to the freight cars the Barney & Smith Manufacturing Co. is finishing an order of ten passenger, one dining and five baggage cars for the road.

Bridge Notes.

An iron bridge will probably be built across Crystal Creek, by Lee county, Ky.

The commissioners of Jefferson and Meagher counties, Mo., have under consideration a project to build a wagon-bridge across the Missouri river, at Townsend, and at Toston. The expense of the latter is to be borne by Jefferson county, and of the former by Meagher county.

Bids for building an iron bridge 90 ft. long will be received until June 1, by J. S. Tooker, County Clerk, Helena, Mont.

The Governor of Maryland has signed the bill to authorize the County Commissioners of Wicomico County to build a bridge across Shell's creek, in Tyaskin district.

The board of county commissioners, of Fergus county, Mont., will receive bids until April 21 for constructing a bridge with a span of 100 ft. over the Judith river. The bridge is to have a 14 ft. roadway and will be 12 ft. high. The commissioners will also receive bids for a bridge over Big Springs Creek, on Main street, Lewiston, with a 50 ft. span and a 28 ft. roadway.

The State Engineer of Colorado has awarded a contract to the Bullen Bridge Co., of Leavenworth, Kan., for building a combination bridge over the Bear River at Thornburg Crossing, in Routt County, Col. The bridge has two spans, each 112 ft. long, and stone abutments and piers, and is to be completed Oct. 1 next. The contract price is \$6,389. Six bridge companies bid on the work.

The New York, Lake Erie & Western is replacing the wooden bridges on its Rochester Division with iron structures. The work will include the building of a bridge 192 ft. long at Batavia, N. Y.

The Intercolonial has asked proposals until April 19 for constructing steel plate girders for a 65-ft. deck bridge, and for a through bridge with a 60-ft. clear span.

A bridge is to be built across Red Lake River at Crookston, Minn., to connect the Duluth, Crookston & Northern with the Northern Pacific.

The Columbia Bridge Co., of Dayton, O., has recently completed an iron truss bridge over Bald Eagle Creek, on Main street, in Altoona, Pa. The bridge is 75 ft. long and 20 feet wide.

Macon, Ga., will probably build a wagon bridge over the Oculgee River at the foot of Second street.

The City of Wheeling, W. Va., proposes to straighten Caldwell Run, which will necessitate the construction of two 25-ft. bridges. Bids for building the structures will be received by F. L. Hoge, City Engineer.

The bridge of the Spartansburg & Union across the Broad River at Columbia, S. C., which was destroyed in a recent storm, is to be replaced at once.

Bids will be received until April 15 for the substructure and superstructure of an iron plate-girder bridge over the canal on Dwight St., at Holyoke, Mass.

The following bids were received for repairing the bridge at Redding, Cal.: American Bridge Co., \$5,077, and \$5,771; King Bridge Co., \$7,531; E. Marwick, \$7,107; Pacific Bridge Co., \$6,136, \$5,488, \$6,700, and \$6,140; California Bridge Co., \$5,360, \$6,860, \$5,900, \$7,100, and \$8,900.

The Railway Committee of the Dominion Parliament has passed the bill providing for a bridge across the St. Lawrence River between Montreal and Longueuil, Que.,

to be built by the Montreal Bridge Co. The charter was amended so that the bridge is to be 170 ft. high, with a single span over the main channel of the St. Lawrence River, between the north shore and the Isle Ronde. The bridge is to be begun in three years and completed in seven years. All plans must be approved by the Governor-in-Council and the Municipal Council of Montreal.

The following bids were received for a steel plate girder bridge at Milford, Conn.: Milliken Bros., New York, \$4,755; Youngstown Bridge Co., Youngstown, O., \$3,780; King Bridge Co., Cleveland, O., \$3,346; Variety Iron Works, Cleveland, O., \$3,194; Wrought Iron Bridge Co., Canton, O., \$3,150; Pittsburgh Bridge Co., Pittsburgh, Pa., \$2,995; Gorton Bridge Co., Gorton, N. Y., \$2,965; Dean & Westbrook, New York, \$2,950; J. E. Buddington, New Haven, Conn., \$2,825; Massillon Bridge Co., Massillon, O., \$2,800; H. F. Hawkins, Springfield, Mass., \$2,797; Rochester Bridge Works, Rochester, N. Y., \$2,685; Berlin Bridge Co., East Berlin, Conn., \$2,377 and \$3,000.

Manufacturing and Business.

The Kalamazoo Railroad, Velocipede & Car Co. has shipped within the last three months three loads of 60 hand cars each, which went to some of the largest railroads in the West and Southwest. The company has also received orders within the last six weeks for over 50 velocipede cars, direct from railroad companies in South America. Mr. Henry W. Payton, formerly Division Master Mechanic of the Missouri, Kansas & Texas, has accepted the position of General Superintendent of this company's factory at Kalamazoo, in place of Mr. Benjamin F. Tiffany, who recently died.

Vaile & Young, of Baltimore, Md., have received an order from the Pennsylvania Steel Co., for about 30,000 sq. ft. of their metallic skylight to be put in at the new steel works at Sparrows Point, Md. Other large orders have been recently received by the firm.

The Buffalo Forge Co., of Buffalo, has an order from the La Belle Wagon Co., of Fond du Lac, Wis., for heating apparatus at its new factory at South Superior, Wis. The hot blast system will be used in the wagon factory, and also for the dry kilns. A complete system of forge blowers and smoke exhaust will be put in the blacksmith shop.

Mr. Spencer Otis, Mechanical Engineer, of Omaha, Neb., has been appointed Manager of the branch office which the Kansas City Switch Co. has opened at that place.

The Berlin Iron Bridge Co., of East Berlin, Conn., has closed a contract with the Brooklyn Brass & Copper Co., of Brooklyn, N. Y., for the iron truss roofs of its new casting shop and rolling mill. The company is now building for the Chesapeake Dry Dock & Construction Co., at Newport News, Va., the largest ship-building plant in the world.

The Scarritt Furniture Co., of St. Louis, has recently added a five-story building to its plant, and now claims to have the largest plant in the world for the manufacture of car seats and reclining chairs. The recent addition has been made necessary by the foreign trade from England, Mexico, Chili, Brazil, Cuba and Australia.

The Springfield Emery Wheel Mfg. Co. now manufactures the car-box grinding machine invented by Stratton & McCullough, of Altoona, Pa. The company has recently opened a branch store at No. 18 West Randolph street, Chicago.

The New Era Mfg. Co., of St. Louis, has just finished an order for the bolts and nuts for the St. Louis Merchants' bridge.

Ritter & Conley, of Pittsburgh, have the contract to supply the Philadelphia company with 7½ miles of 36-in. riveted pipe. The contract amounts to about 2,600 tons, and will take from eight to 10 months to complete. An 80 x 160 ft. shop for hydraulic work is being erected by this firm, but it will at present be devoted to the work on this contract.

The Chicago branch of the Lidgerwood Mfg. Co., of New York City, has recently closed many large orders, among them the following: Large double friction drum mining engines and boilers to the Shafer mine and the Mansfield Iron Mining Co., both of Crystal Falls, Mich.; to the Nanaino Mining Co., of Iron River, Mich., a large single drum, double cylinder reversible mining engine, and a large double friction drum mining engine with boilers; a double cylinder reversible hoisting engine to the Valley Mining Co., of Bessemer, Mich.; four large reversible hoisting engines to the Schlesinger (Iron Mining) Syndicate; and many small exploring engines intended for the Lake Superior mining regions.

The Secretary of State of Illinois issued licenses March 27 to the American Electric Sub-Company at Chicago to manufacture all kinds of electric apparatus. Capital stock, \$250,000. Incorporators, F. E. Shaw, William Martin and W. O. Johnson.

The Congdon Brake Shoe Co., at Chicago, has lately increased the capacity of its foundry by extending the molding room and replacing the old blower with improved Sturtevant steel pressure blower No. 8 on adjustable frames placed in a tightly sealed separate room. A 60-inch "Buffalo" fan ventilates the molding room.

Iron and Steel.

Shoenberg & Co., of Pittsburgh, are having constructed for them by Macintosh, Hemphill & Co. a pair of 28 x 36 reversing engines for their blooming mill. At the furnaces of Schoenberger, Speer & Co. the device for conveying the molten pig metal direct to the converters is being tried.

The Chicago Forge & Bolt Co. have contracted with John Zellweger, 162 La Salle street, Chicago, for an additional Zellweger gas-heating furnace for its rolling-mill. This will make the third furnace of that type in use by the company. Mr. Zellweger is building a similar furnace for the Chicago, Burlington & Quincy shops in Aurora, Ill., for scrap and for axes, and another one for the St. Louis Steam Forge & Iron Works at St. Louis.

A casting, weighing 70 tons, was successfully made last week in the forging plant of the Bethlehem Iron Co.'s works at Bethlehem, Pa. The casting will be used for the new hammer in process of erection in the ordnance plant.

Jas. McGill & Co., Ltd., of Pittsburgh, are building four Aiken hydraulic cranes for the Pennsylvania Steel Co., of Steelton. Two of the cranes are 5-ton and two are 10-ton machines.

The Leeburg Foundry & Machine Co. has received, among other orders, one from the Troy Steel & Iron Co., Troy, N. Y., for ingot molds.

The third of the new charging engines which are being put into the blooming mill of the Edgar Thomson Steel Works was put in operation this week, making a complete set. A new furnace was also completed this week.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The most important event of the week was the submission by the Committee of the Interstate Commerce Railway Association of the new form of agreement. An extended abstract of it will be found in our traffic department. The main idea is to include all roads between Chicago and the Rocky Mountains, and to fix definitely the responsibility for making and maintaining rates. There is no effort, however, to make this other than a moral responsibility. Any system of arbitration or of penalties is distinctly disavowed as impracticable. Moreover, the new agreement leaves the roads free to consolidate or to concentrate control by leases or otherwise, with no restriction except that all the roads in the association shall be informed of the terms of the agreement between the contracting roads a month before it goes into effect. In short, the agreement is such a modification of the "gentlemen's agreement" as will make it easier for the roads to abide by it. That it will be adopted by all the roads in the territory included, and that they will give it a loyal trial, is perhaps too much to expect yet. Nothing was done toward the immediate restoration of passenger rates, which has been hoped for by many, but the movement to reorganize the Passenger Association is apparently to go forward regardless of any delay in settling the larger problem.

We present in another column some interesting statistics collected by the Massachusetts Railroad Commission concerning facing-point switches and safety devices on roads of that state. The figures concerning automatic block signals are not given with precision, but the Old Colony states that 111 miles of its track is protected by track-circuit signals. The Boston & Albany has about 53 miles equipped with continuous sections, and other roads have shorter distances. Estimating the length of track covered by automatic station signals as half a mile for each signal, we find a total of nearly 400 miles of track in Massachusetts protected by some kind of automatic signal. Forty-nine of the signals on the Boston & Albany, which we have estimated as above indicated, will soon be replaced by 66 miles of continuous block signals of the Hall system. This road has 17 interlocking towers. It is to be regretted that these roads, so enterprising in many respects, still regard the old-fashioned ball signal as a "protection" for facing-point switches. It may perhaps be regarded as such when the weather and the switch tender's brain are both clear, but as these roads run a good many fast trains, and doubtless desire to run them rapidly during fogs and storms, when a ball is likely to be no protection, as well as at other times, it is somewhat farcical to refer to this antiquated device as a protection. The Com-

missioners present to the roads an excellent argument in favor of the adoption of the standard code of train rules, which we also copy, and which is well worth reading.

On another page will be found two reports on the wear of steel tires of locomotive drivers made at the last meeting of the Central Railway Club (Buffalo). In the report of Mr. Griffith we find the proposition that "the greater the weight the greater the wear." In support of this is given the record of three engines having 93,600 lbs. on the drivers which made an average of 3,594 miles per $\frac{1}{4}$ in. tire wear, and of one engine in the same service with 84,000 lbs. on the drivers which made 6,656 miles per $\frac{1}{4}$ in. These all ran on the level. Two engines of the latter class, working on grades of 32 to 63 ft. per mile, made 4,730 miles per $\frac{1}{4}$ in. We should hesitate to accept the proposition on this evidence. It is pretty generally held that slipping the wheels is a great source of tire wear, if not the greatest. In fact, Mr. Griffith's first proposition is the "slip of an engine determines the wear of the tires." It follows that, other things being equal, the heavier engine will slip least and will consequently wear its tires least. This is borne out by the statement in Mr. Foster's report at the same meeting in which is the statement that "heavy engines wear their tires less than light engines doing the same service." In fact the elements of tire wear are so complicated and so much depends upon the runner's handling that conclusions drawn from two or three observed examples are extremely unreliable. Therefore we should attach little weight to Mr. Griffith's results obtained with six engines when they go counter to accepted theory. It is to be noted that the records of wear are unusually good. The three heavier engines made 3,594 miles per $\frac{1}{4}$ in. or 14,377 per $\frac{1}{16}$ in., and the lighter one made 26,624 miles per $\frac{1}{16}$ in. The lighter engines on grades made 18,920 miles per $\frac{1}{16}$ in. About two years ago we gave a case of an engine on the Cumberland Valley which made the very remarkable record of 55,000 miles to $\frac{1}{16}$ in. tire wear before the first turning. In 1870 the Master Mechanics' Association report gave the average of 6,206 tires as 15,868 miles per $\frac{1}{16}$ in. But in recent years the endurance of tires has fallen very much below this average. In 1887 the Master Mechanics' Committee gave 9,810 miles as the average of 50 tires on five different roads. The individual results varied from 3,372 to 25,104 miles. It will be seen that the highest record given by Mr. Griffith is better than this maximum, and the average of his three heavy engines is 46 per cent. better than the average of the 50 tires. The best result ever obtained on the Chicago & Northwestern was reported a few years ago as 18,000 miles per $\frac{1}{4}$ in., which it will be noticed is far below the best result reported by Mr. Griffith.

Coupler Makers and Coupler Lines.

At the Western Railroad Club, at its last meeting, it was proposed to make a new interchange rule, as follows:

Rule 16. In repairing damaged cars, M. C. B. standards may be used, when of design and dimensions that do not mar or impair the strength of the car, in lieu of the parts forming its original construction.

The M. C. B. automatic drawbar of any recognized manufacture may be used, providing it conforms strictly to the lines adopted by the association, and also providing that not less than 25,000 cars are in successful service equipped with the drawbar.

This is a proposition which has more bearing on the coupler question than might at first be supposed. The object of the rule is to prevent the introduction into service of a great variety of coupler designs, more or less superfluous, and more or less inefficient. This was expressed by the member proposing the rule, as follows:

The questions are frequently asked, what can we do to contribute to more uniformity in car construction, what steps can we take to introduce the standards of the Association more generally, and what is the advantage to railroad companies of the M. C. B. standards? A new rule, such as is outlined for No. 16, would, in part, answer each of these questions. The use of M. C. B. standards in lieu of the original construction has been tacitly accepted between some railroads for years past, and we are of the opinion the time is now ripe to make it one of the rules of the Association. Prior to the Association's present stand on the drawbar question, a favorite way of showing the evils of each line having its own standard bar was to tabulate the number of different drawbars a through line was obliged to carry for foreign cars. Unless some immediate action is taken on this matter the members of the Association will find that in place of carrying 40 or 50 different kinds of link-and-pin drawbars, the day is not very distant when we may find ourselves obliged to carry a nearly equal variety of a much more expensive bar. That such

bars must conform strictly to the M. C. B. lines is an important qualification, and one which it will be well, not only for railroads but for manufacturers, to pay more attention to than they are now doing. We have known M. C. B. couplers issued by one firm made so carelessly that they would not couple with each other, and others that are being introduced vary from the lines in important particulars. By ignoring the M. C. B. lines it is possible under certain conditions of wear, to render the coupler an insecure one.

The rule suggested was adopted by the club without discussion; that is, the club expressed itself as in favor of inserting the rule in the Rules of Interchange. It seems not only a reasonable, but a desirable one. Doubtless it will be said that such a rule would operate somewhat against the introduction of a new coupler by the requirement that 25,000 must be in use before it could be used for repairs of foreign cars. It is possible that a coupler of new design or new material may be brought out that will be as good as, and cheaper than, any of the M. C. B. couplers now made, and there might be some hardship to the road making repairs or to the maker of the coupler in obstructing its use in repairs. This, however, is not a very probable supposition. At least it is not likely to happen soon. On the other hand, it is of great importance that the coupler put in should be a good one, and the requirement that at least 25,000 shall be in use before it can be used in repairs of foreign cars will be a pretty good guarantee. At present there are, we believe only two companies which have as many as 25,000 couplers of their make in use, and according to the rule only these two couplers could be used to replace broken ones at interchange points.

The requirement that couplers used in repairs must conform to the standard lines is vital. It is a surprising fact, but one known to a good many, that couplers now offered, and by reputable makers, will sometimes not couple with each other, and vary in some cases as much as 10 per cent. from the standard M. C. B. dimensions. One of the most marked and least excusable deviations from the standard dimensions is in the thickness of the knuckles, which are standard at 3 in. thick and are furnished at 2½ in. Several designs have this defect, why is not apparent, unless it be to make the coupler more readily constructed out of rough castings, and to reduce its weight and its cost. Changes that would increase the efficiency of the coupler might be admitted; but such as only weaken it, as well as interfere with its interchangeable use, will have to be stopped if its rapid and general introduction is to go on. There is talk now of putting in the Rules of Interchange a clause to the effect that M. C. B. couplers not conforming within definite and reasonable limits to the standard lines shall be declared out of order and not accepted at interchange points.

As we have said, rigid conformity to the standard coupler lines is vital. It is essential, not only for the free interchangeability of cars, but for security as the coupling faces wear, and there is no scientific reason for departing from them. Every one knows that the lines as adopted were the result of much careful investigation by able committees. They were finally evolved as being the best contour that could be made for cars of different lengths, on all practicable curves and on tangents. They were tried, in full-sized couplers, on cars before they were adopted. It happened that the essential principle of contact on the lines of vertical cylinders was patented, but it is known that the patent is waived for all members of the Master Car Builders' Association, and for all manufacturers making couplers for members. Therefore any departure from the contour is not only probably a scientific mistake, but there is no business reason for it. If manufacturers were allowed to depart arbitrarily from a standard fixed with such care and arrived at after such long and patient consideration, it would be futile for the associations to make standards. All the dignity and weight of their conclusions would be lost.

Changes in construction and material are constantly being made in the M. C. B. couplers and some of these changes are of considerable importance. They are not, however, in the standard contour, but are designed to increase the strength to resist buffing blows and pulling strains as well as to increase the wearing qualities of the joints, locking pins and the face of the knuckles. In these directions the manufacturers will find enough to devote their attention to without changing the standard lines which must lie wholly in the hands of the Association, if there is to be harmonious and steady development. All of this applies with more or less force to various other standards which are undergoing insidious changes at the hands of manufacturers without the sanction of the associations. It is the

duty of the associations to guard their standards jealously while they are standards, and to change them in a public and authoritative way when they need changing.

The Minnesota Decision.

There is in many quarters a tendency to attribute to the Minnesota decision more importance than it really possesses. Some people speak as though the Supreme Court had reversed the principles enunciated in the Granger cases, and had started the development of railroad law on a new track. This is not so. The apparent conflict between this decision and the Granger decisions is a rather superficial one. The questions decided in the two cases, though alike in form, were wholly different in substance.

It is true that, in each case, the legislature had passed a law with regard to rates; that in each case the railroads questioned the constitutionality of the act; that in the earlier instance the courts sustained the legislature, and in the present instance the railroads. From this simple statement people rush to the conclusion that the second decision must be, in some sense, at variance with the first, if not involving an actual reversal of it.

But the issue in the two cases was different. In the Granger cases, the railroads objected to legislative regulation as such. They held that railroad men had the right to make what rates they pleased for the use of their property. They claimed that it was their own private business, and ought not to be subject to special acts of the legislature. Against this view the courts opposed the doctrine of virtual monopoly, which forms the main feature in the case of *Munn versus Illinois*. Wherever the nature of a business is such that competition becomes inoperative, the "reserved police power" of the state may be exercised. In ordinary business, the legislature does not try to regulate charges, because competition regulates them far better; but where the action of competition is absent, or at least habitually imperfect, the state possesses the right to interfere and has frequently exercised it. A man who has invested his property in such a business, whether it be an elevator, a ferry, or a railroad, has done so in full view of that liability to special control. No injustice is therefore done him by the exercise of such a right. It is in this sense that he is held to have "dedicated his property to public use."

When the railroads claimed that they could make what rates they pleased, and that nobody else could interfere, the courts would not sustain them. But to-day the case is different. To-day it is the government which claims the right to make what rate it pleases. Against this unlimited claim of the government the courts take as strong ground as they previously did against the unlimited claim of the railroads. The railroads, if left to themselves, were thought liable to make unreasonably high rates; there was, therefore, a case for interference. The legislature, if allowed to interfere without check, was liable to make rates unreasonably low; the courts will, therefore, limit that right to interfere when it is carried too far. The fundamental object of the law is to have rates reasonable for both parties. In the view of the court this involves both the right of the legislature to interfere and the right of the railroads to have this interference limited.

In this view the Supreme Court decisions have the highest kind of consistency—a consistency of purpose. The court intends to "see fair play," and will not accept any principle, whether of political economy or of constitutional law, which would limit its right to do so. It has a commanding position which it does not propose to abandon. Its attitude, amid much apparent change of ideas, is like that of the Vicar of Bray—

"And 'his is law, I will maintain
Unto my dying day, sir,
That whatsoever king shall reign
I'll be Vicar of Bray, sir."

The only difference is that the vicar maintained his position by harmonizing with every successive view that prevailed, while the Supreme Court reaches the same result by opposing them all. But the general effect is identical. Whether Railroad King or King People be uppermost, the court consistently proposes to claim and exercise its legal right to Bray.

Not that we agree with Dickens in thinking that "the law is an ass"—at least not in this instance. On the contrary, we think that the decisions of the court are in each case in the line of good railroad economy. The main principles of the Granger decisions, though objected to by railroad men at the time, are now acquiesced in and regarded as self-evident. It seems hard to believe that railroad owners and managers fifteen years ago should have claimed that rail-

road business was like any other business, and that there was no more ground for government interference in the former case than in the latter. Most railroad men have come to see two sides to a case where at first they saw only one. Perhaps in the course of time Western legislators may learn the same lesson. It is fortunate that the United States courts occupy a middle position from the outset, so as to tide us over the worst dangers before the extremists have learned how much caution the case requires.

A Word More About Counterbalancing.

In another column is a letter referring to suggestions made by "Tenax" in the *Railroad Gazette*, Dec 20, 1889. If our correspondent will go carefully over the balancing of locomotives with three cylinders, as suggested by "Tenax," he will find that the unbalanced vertical action with cranks at 120 degrees is smaller than he supposes.

Our correspondent has written before regarding three-cylinder compound engines with cranks at 180 degrees, and while such an engine may readily be counterbalanced, it is not very clear that "no difficulty need be apprehended in contriving this," for reasons which we have previously given when referring to this subject. Neither does it appear why the inside cylinder in high pressure could well afford to carry heavier parts. It may be, as suggested, that the variation in design of locomotive to reduce the rail pressures "will tend to go beyond a mere reduction in weight of parts or increased wheel diameters;" but whatever such variations may be, they must be accompanied with extreme simplicity, and it will probably be some time before any radical change will be made in the general type for the purpose of decreasing the effect on the rail of the excess of counterbalance, for the reason that we have now at hand means for reducing this effect much below that which obtains in the average eight-wheel engine. For instance, the decrease in the weights of the reciprocating parts can be at least 30 per cent., and it is not a difficult matter to reduce them 50 per cent. In one case recently the weight of the main rod alone was reduced 50 per cent. by fluting it and paying careful attention to dimensions. Just as soon as designers appreciate the necessity for careful reduction of weights such reductions will be made quickly and universally. In addition to this reduction we have the decrease brought about by an increase in the number of driving wheels which is becoming the favorite method of obtaining increased adhesion. The heavy express engines, which are those most liable to injure the track, are now made with six driving wheels, which decreases the effect of the excessive balance on the rail 33 per cent. Then there is another step remaining before it is necessary to radically change designs. It is an increase in wheel diameters, which would be far more acceptable than any radical change of type. As shown in the *Railroad Gazette* of March 21 an increase in the diameter of the driver 16½ per cent., reduces the power of the engine the same as reducing the stroke from 24 to 20 in., and reduces the effect on the rail about 25 per cent. As a result of these changes—reduction of weight of reciprocating parts, using six drivers and increasing the diameter of the driver—we might diminish by, perhaps, 63 per cent. the effect on the rail. Now, if this can be done, or if considerably less is done, the result will be sufficient to postpone for a long time any necessity for a change in type to gain further reduction. Particularly is this true when it is remembered that each year brings to us heavier rails, better roadbeds, and better bridges with heavy floors. The heavier the floor the less will be the effect of the counterbalance on the bridge, as is readily seen by comparing the inertia of bridges with heavy and light floors.

Again, there is another reduction which will accompany those above mentioned. There is a certain amount of weight of reciprocating parts which now remains unbalanced in a satisfactorily balanced engine, and the smaller the weight of the reciprocating parts the greater the ratio which this portion remaining unbalanced bears to the whole, resulting in less weight which has to be balanced. If the weights to be balanced could be reduced 75 per cent. below what they now are, probably the remaining 25 per cent. would require no balance whatever. Therefore, it is not difficult to believe that engines of new and novel construction intended to obviate the results of imperfect counterbalancing will not be extensively used for some time to come.

Our correspondent refers to the American cross-head as having a superabundance of material. He might go still further and say that many of the English cross-heads have more than the American. The case

which we have cited (see *Railroad Gazette*, Dec. 20, p. 839) of English reciprocating parts weighing less than American was a special case for comparison only, simply showing the possibilities. We have, on the other hand, material for comparisons showing some of the English construction to be heavier than the average American. We did not intend to call attention to the comparison of average weights of English and American reciprocating parts, but only to show the possibility of reducing the American weights by indicating what was done in England in special cases. The same comparison might have been drawn between special cases in France, where some of the reciprocating parts are lighter than the English.

The remarks of our correspondent with reference to the jacketing of the cylinders are not to be taken as conclusive or as settling the necessity for steam jackets. His colleagues in England are yet discussing the advantages of steam jackets, and the brightest minds among his countrymen seem to be equally divided on the subject. Surely, then, if the saving brought about by a steam jacket is not so marked as to settle conclusively its advantages in marine engineering, there is but little use to agitate the use of jackets in locomotive work where the trouble would more than counteract any gain that has yet been generally admitted as possible to obtain from jackets. It is true that we do need to pay better attention to the coverings of our cylinders and steam chests, but so do builders in all other countries, particularly in the case of those English engines with outside cylinders and inside steam chests, where the ports are enormously long and the clearance immense.

The compound locomotive will be well tried here in the next few years, but it is best that such locomotives be not loaded down with other supposed improvements and changes in design, which may so materially affect the economy and operation as to throw discredit on the compound principle. Let us have the compound engine by itself, and learn first what are its real merits, then if its success stimulates improvements in the design of other portions of locomotives, let them follow and be tried independently.

The Demand for Railroad Stocks.

Side by side with increased railroad traffic we have diminished railroad stock sales. From the Wall street standpoint this is bad; from the standpoint of actual railroad operation, it is probably good. It indicates that stocks are on the whole valued higher by their holders than by other people.

This should be the normal state of affairs. Activity in the stock market is not, in itself, a desirable thing. It may be a symptom of good business conditions in some other respects; but in the immediate effect it is not a good thing to have investments change hands rapidly. A security which is constantly transferred from one owner to another is not ordinarily an investment, but a speculation. It is not bought for its permanent value, but for some temporary object. The pursuance of those temporary objects can never do the property any good, and may often do it a great deal of harm. If the changes of stock ownership are accompanied by changes of management, this liability to harm becomes almost a certainty.

If stocks are held, they are apt to be held pretty nearly for what they are worth. If they are rapidly bought and sold, their value is affected by freaks of public judgment. It may not be always true that a dull stock market is wise, but it may be laid down as a sure principle that an active stock market is mainly unwise. On general grounds, the holders of stocks know more about the real worth of the property than the buyers; or at least than the outside buyers. The crowd buys a stock which it sees going up; it thus produces an inflation of prices, of which schemers are only too ready to reap an advantage, at the cost not merely of the green investor, but often of the permanent interests of the property itself.

Nor is this all. If active purchases put the stock of existing roads up to a figure higher than its investment value, investors are led to look elsewhere. If they cannot buy stock or bonds of existing roads, they will invest their money in the securities of parallel roads yet to be built. This is always a danger, and sometimes a very great danger. It would be specially disastrous now, when an increase of railroad construction would remove the only security which we have against reckless state legislation.

The additions to the stock capital of railroads in the United States are now just within the limits of \$300,000,000 a year, or less than a million dollars a day. The average value per share of railroad stocks sold on the New York Stock Exchange is probably not far from \$50. On this assumption, 20,000 shares would more than represent the daily investment of the country in

railroad stock. Any demand above this is not investment, but transfer of investment. The business of April 1, which was 68,000 shares, is called absurdly small; but it represented more than three times the investment demand of the country. Two-thirds of it was not investment, but trade in investments. The latter is not a wholly bad thing. It has its use; but this has probably been outweighed by its abuse. At any rate the facilities for carrying on trade in investments have been expensive; and if the present dullness in Wall street should result in cutting some of them off, the country could probably get along without them.

The public has been at the losing end of this trade for a great many years. It is now beginning to realize the fact. It is beginning to see that unless a man wants a stock, the presumption is that he had better not buy it. The purchasing demand has come down to a figure not outrageously disproportionate to the investment demand of the country. It is, we suppose, too much to hope that it will stay there permanently; but it is in the interests of good railroad-ing that it should do so as long as it can.

The Lake Shore & Michigan Southern legal department is now wrestling with an interesting little passenger question. Lately a citizen of an obscure village of Indiana purchased round trip tickets for himself, wife and child. On his return from his visit he forwarded to the headquarters of the road for redemption the half-fare ticket which he had purchased for his child. Investigation showed that the child had accompanied its parents on the journey, but that the conductor had neglected to collect its fare. The query is, must the road, knowing the above facts, redeem the ticket or, declining to redeem it, must the ticket be returned to its owner? About the only certain element in the case is that the Hoosier is not overburdened with modesty.

The paper from which we take the above heads the item "A legal point." This sounds absurd. Every one knows that a child coming within the prescribed limits of age is equitably bound to pay fare; if he rode a week or a year ago and did not pay he should pay now. After the railroad company has announced its regulations it is guilty of discrimination if it carries a person in violation of them. And yet the arguments which people will use to quiet their consciences on this point are made very plausible and convincing, and the absurdity of this claimant's position is not easily demonstrated to him and others whose views are based on similar theories and experiences. Conductors will not only be easy in giving passengers the benefit of the doubt in collecting fare for a child of debatable age; they will habitually ignore the presence in a car of children whose age is not debatable, as regards the well-known limits. Nay more, they will express surprise to a mother who presents a half ticket for a boy of eight (or for one of 9 or 10 if he be small), plainly advising her, by manner if not in words, not to purchase a ticket for the child next time she travels. Another conductor may endeavor to fairly enforce the rules, but has not the passenger considerable ground for assuming that the affable and not the unyielding one most truly represents the company? The latter is quite likely a harsh-mannered person, while the former is probably one who "makes friends of all he meets." Why conductors pursue this slipshod policy is not exactly clear, unless it be from pure laziness. Where the traffic is such that acquaintance with passengers is an element of pleasure and success to a conductor, there is a show of reason in this imitation of the unjust steward; but where there is not one chance in a hundred that he will ever see the passenger again, the case is not so clear. If it be deemed advantageous to the road to relax rules in this way, why should he not consult the superintendent about it? There are good business reasons for doing small favors to patrons for the sake of cementing their good will; but a public institution like a railroad should grant them with caution. A grocer may present a pennyworth of candy to a child for the sake of its influence on the child's parent, but a railroad cannot do the same without breaking the Interstate Commerce law—unless it posts in two public places a description, in large type, of the kind, size and quality of the confectionery. Seriously, though, whether traffic be inter-state or intra-state, it is time that the easy conductors be reined up, or the rigid ones be instructed to drop down to the others' level.

Discussions concerning trunk line rates have occupied the attention of the Executive Committee and other branches of the Trunk line organization a good deal of the time during the past few weeks, numerous and somewhat protracted meetings being held; but the results seem small. The differences between all-rail rates and those by lake via Duluth on traffic to and from St. Paul have been the subject of conferences at both New York and Chicago, but the demand of the lake lines that their rates shall be (the same as last season) low enough to take the bulk of the freight, and the contention of the Chicago-St. Paul rail lines that the tariffs by the respective routes should be more nearly equal, seem no nearer agreement than at the beginning of the controversy. At last accounts several of the roads interested refused important concessions demanded by the others, and the lines from the Atlantic seaboard resolved

to put into effect at the beginning of navigation the rates in force last year. Rumors of widespread rate cutting on westbound freight were discussed at the last meeting, but the reporters could not learn that anything was proved against any road, or even that the accusations were at all definite.

The Chicago city council has passed the rate of speed ordinance presented by Mayor Cregier when he vetoed the one previously passed by the council. The first two sections of the new are similar to those of the old ordinance. They prescribe the districts and the rate of speed as in the original ordinance. The new clauses are intended to more thoroughly protect the city against liability, and to more explicitly state that the city enters into no contract and binds itself to no permanent plan or system. The ordinance, it will be remembered, allows trains to run at 20 miles per hour in the first district, 25 in the second, and 30 miles in the third. The first two districts embrace the old city and the third takes in the new limits. The roads are to erect fences and gates as soon as possible. The Chicago, Rock Island & Pacific and the Chicago & Northwestern have notified the mayor that they will comply with the new regulations, and will accelerate the speed of their trains on and after April 6. The railroads have been reminded that the old ordinance limiting the length of freight trains to 700 ft. has been disregarded, as also that prohibiting the occupation of a street crossing more than five minutes at one time.

The New England Railroad Club must be anxious about the trouble that the inexperienced men who live west of the Connecticut River are laying up for themselves by putting on M. C. B. couplers. A few weeks ago we noted the fact that the Chicago, Burlington & Quincy is about to equip 6,750 cars with them, and now the New York Central & Hudson River has ordered them for 6,000 cars to be built at once—3,000 to be equipped with the Gould and 3,000 with the Standard (Dowling) coupler. As long ago as June, 1889, the Central had 8,000 cars equipped with the M. C. B. coupler, according to statistics gathered by us at that time. Although the Burlington has not been one of the greatest users of it, and has been very careful in its investigations, it has long had in service more cars with the vertical plane coupler than all the New England roads together. Apparently some one is making a big mistake, and in the interests of railroad economy the servants of the New England Club ought to tell us who it is. They owe it to the public.

An international exhibition is to be held in the island of Jamaica in January, 1891, and manufacturers and others in the United States are invited to send exhibits. The plan and scope of the exhibition is modeled after that of larger affairs, and it is expected that visitors will be drawn not only from all the other West India islands, but from the various South American states. Jamaica has 90 miles of railroad, which has recently come into the hands of an American company, and the railroad system of the island is being extended. Makers of railroad material and supplies, as well as of general machinery, will doubtless find the prospectus of this exhibition worth attention. It is said that a number of machinery exhibits have already been promised from this country. Mr. G. de Cordova, 4 Stone street, New York City, can give all needful information, and is prepared to attend to the shipping and care of exhibits.

The tornado which destroyed much property and killed about 100 people in Louisville, March 27, seems to have done comparatively little damage to the railroads. A train of the Chesapeake & Ohio, just starting out of the depot at Louisville, was partially wrecked by the demolition of the train shed, but the passengers and employés all escaped with slight injuries. A freight train was derailed a few miles southwest of Louisville, and a passenger train was derailed and overturned by a tree which had been blown across the track at Vienna, Ind., on the Jeffersonville, Madisonville & Indianapolis. The engineer of this train was killed. The Cumberland River bridge, on the Chesapeake & Ohio Southwestern, 23 miles from Paducah, Ky., was destroyed by the cyclone, but no particulars have reached us.

Through trains between San Francisco and Portland, Or., were resumed March 24, after what was perhaps the longest blockade on an important railroad ever known. The line was closed by snow about Jan. 20, and before the snow could be cleared mild weather caused washouts and landslides, which completely blocked the track at scores of places. It is reported that the cost to the company thus far is about \$100,000 and the loss of traffic \$150,000. As several miles of road had to be rebuilt, and some of it even relocated, the total loss is still indefinite.

NEW PUBLICATIONS.

Journal of the Association of Engineering Societies, February, 1890.—This is the first issue of the *Journal* since the office of publication was transferred to Chicago. The papers contained in it are: Tests and Observations on Building Stones, by Mr. J. A. L. Waddell; Address on Retiring from the Presidency of the Engineers' Club of St. Louis, by Col. E. D. Meier; Notes on the Harbor Facilities of Cleveland for the Handling of Coal and Ore,

by Mr. Augustus Mordecai; the Cleveland Loop Line Railway, by Mr. John H. Sargent, and Some Points in Bridge Inspection, by Mr. Henry Goldmark. The usual index to current literature also appears. The secretary of the Association is now Mr. John W. Weston, 78 La Salle street, Chicago, Ill.

A Report on Washington Territory. By W. H. Ruffner, LL.D. Illustrated, pp. 242. New York: Seattle, Lake Shore & Eastern Railway, 1889.

This is a handsome volume, with a number of very fair cuts and maps, written and published evidently as an advertisement of the railroad company whose imprint is on the title page. But although the report is quite obviously *ex parte*, it gives much valuable information of the climate, geology, soil and resources of Washington. Dr. Ruffner's visit was made in the fall of 1887, and apparently the report was prepared for publication in January, 1889, therefore the statistics of some of the cities have ceased to be correct. For instance, in the year that passed between the author's visit and his final report the population of Seattle increased from 15,000 people to 25,000, and that of Spokane Falls from 7,000 to 12,000. But the chapters on the resources of the State, especially those on the coal, ores and timber, have permanent value.

Annual Report of the Chief of Engineers United States Army for the Year 1889. In four parts.

The scope of this work is so well known that it scarcely needs mention. It is the record of the work of the officers of the engineer corps for the year and is a vast mass of engineering literature, much of it of value. The usefulness of the volumes would be greater were they provided with an alphabetical index, and if the running heads of the pages gave some clue to the subject matter. Of course very much the larger part of the report concerns the work on the rivers, lakes and harbors.

Transactions of the Technical Society of the Pacific Coast.—The issues of November and December, 1889, and January, 1890, are consolidated in one pamphlet, which contains a very long and apparently carefully studied paper on "The Strains in Curved Masonry Dams," by Hubert Vischer and Luther Wagoner. The other papers of the same issue are: "What Constitutes a Map," by William G. Raymond, and "A Graphical Method for Estimating Earthwork," by the same author. The latter is a brief discussion of the graphic method given by Professor Johnson in his text book on surveying as modified by Mr. Raymond. The *Transactions* may be obtained from the Secretary, Mr. N. S. Keith, 508 California street, San Francisco.

School of Mines Quarterly.—The editors of the *School of Mines Quarterly*, Columbia College, New York City, have issued a table of contents of the *Quarterly* from Volume 1 to 10. The editors have in stock copies of nearly all the issues, and can furnish complete volumes from Volume 6 to Volume 10, and will also furnish a carefully prepared index of all ten volumes for 25 cents.

TRADE CATALOGUES.

Catalogue and Price List of the Brown & Sharpe Manufacturing Co., and of the Darling, Brown & Sharpe Co., Providence, R. I.—The new edition of the consolidated catalogue of these companies, dated January, 1890, is received. It contains a list of the machines and tools exhibited at Paris last summer, for which the Brown & Sharpe Manufacturing Co. received the award of the grand prize. Reductions in prices of various tools are announced, and a memorandum is given of new machines and tools added during the last year to the regular line manufactured by these companies.

Illustrated Catalogue of the Kalamazoo Railroad Vehicle & Car Co., Kalamazoo, Mich.—The catalogue of this company for 1890 shows several new designs and same improvements in their old standards. Particular attention is called to a new steam inspection car and to an improved side-brake hand car.

Messrs. Howard & Morse, of 45 Fulton street, New York City, have issued a pamphlet, No. 96, describing their high speed steam engine, known as the "Solano." This engine has three cylinders, and is well described in the pamphlet of eleven pages, which may be obtained by addressing the makers as above.

Something About Culvert Pipe. Blackmer & Post, St. Louis, Mo.—The publishers say in their preface, "this pamphlet is designed to convey to consumers of vitrified culvert pipe, and particularly those interested in the construction of railroads and water-works, some knowledge of its material, its manufacture, its uses, and especially the important relation it bears to the construction of railroads in this country. Twelve years ago the use of vitrified pipe for culverts under railroads was considered a doubtful experiment. Now it is generally recognized as an important factor in the economical and substantial construction of railroads, and since we commenced the manufacture of our double strength culvert pipe in 1878, we have furnished to railroad and construction companies nearly 800,000 ft. of various sizes for culverts under their tracks.

"This material being so much lower in price than iron

and more lasting, so much more convenient and economical in construction than stone masonry, so much more durable and stronger than timber, we feel justified in believing that no well-informed engineer, with true knowledge of its merits, will recommend the use of any other material where our double strength culvert pipe can be placed to advantage."

This pamphlet gives a brief history of the use of culvert pipe in railroad work and many letters from railroad engineers commending it. A few drawings are also given of standard culverts. The following table of sales of culvert pipe is given as showing their relation to railroad construction. It will be seen that the volume of sales has varied closely as the mileage built each year.

Year.	Feet sold.
1878.....	11,538
1879.....	31,564
1880.....	41,104
1881.....	62,220
1882.....	74,050
1883.....	40,002
1884.....	55,638
1885.....	60,238
1886.....	95,294
1887.....	100,682
1888.....	82,917
1889.....	112,001
Total.....	763,306

THE SCRAP HEAP.

Notes.

On some of the Pennsylvania lines west of Pittsburgh the rule in the treatment of old cars is to destroy all requiring repairs to the extent of \$100 or more each.

The Railroad Commissioners of Missouri has notified the Wabash that the Columbia branch of that road is in a very unsafe condition, and direct the General Manager to repair it without delay.

It is stated that the claims of England and the United States, arising from the seizure of the Delagoa Bay Railroad by the Portuguese government, have been settled, with the exception of carrying out certain formalities.

The Illinois Central has fitted out an instruction car which is to be sent over all the lines of the road to instruct the trainmen in the working of the Westinghouse automatic brake, preparatory to using it more extensively in freight service.

The city council of Elizabeth, N. J., is unable to agree upon the plans for the abolition of the grade crossings in that city as approved by the roads. Property owners protest that the rights of abutters on the streets near the proposed bridges are not properly guarded.

A Boston paper complains that the Old Colony does not comply with the Massachusetts law requiring railroads to pay their employees weekly. It is further stated that the Railroad Commissioners are bound to see that the law as applied to railroads is enforced, but that they neglect this duty.

Charles Delavergne, the engineer of Erie train No. 14, who ran his engine into the rear of Train 12 at Owego on Jan. 30 last, has been indicted on a charge of negligence. He gave bail in \$500 to appear. An attempt was made to indict him for manslaughter, but the jury would not find a bill for that offense.

The Ohio Legislature has enacted a law prohibiting railroad companies from requiring employees to join insurance associations, making companies responsible for damages for injuries sustained by employees through the negligence of other employees, and declaring defects in cars and machinery prima facie evidence of gross negligence.

Directors of the Atchison, Topeka & Santa Fe have been looking over the extensive terminal properties of the road in Chicago, and the Chicago papers state that the company proposes to enter upon important improvements, of which the principal feature will be an elevated track from Ashland avenue to Polk street. This will avoid a number of very bad grade crossings.

A dispatch from the City of Mexico, March 25, announces the conclusion of a contract between the government of Guatemala and a French syndicate for the construction of a railroad from the city of Guatemala to the Atlantic Ocean and its consolidation with the existing line from Guatemala to the Pacific. This is the same report circulated several weeks ago and has not been confirmed.

A Pittsburgh paper says that "bananas, new figs, fresh caramels and sweet oranges" are no longer obtainable on the trains of the Pennsylvania, that company having ordered its conductors to enforce the provisions of the contract with the Union News Company, which forbids the "train agents" to sell anything but papers, magazines and books. The News Company states that this will reduce the profits of the trainboys to such an extent that they will resign, and the unfortunate people residing at way stations will suffer from the lack of newspapers.

Chicago Terminals.

Some idea of the extent and value of terminal facilities necessary to the conduct of railroad traffic may be had from a glance at the annexed statement of the amount of yearly taxes paid in Cook county (Chicago) by the railroads enumerated:

Chicago & Northwestern.....	\$81,150
Chicago, Milwaukee & St. Paul.....	42,120
Chicago, Burlington & Quincy.....	46,051
Chicago & Alton.....	20,359
Chicago, Rock Island & Pacific.....	61,936
Chicago & Grand Trunk.....	15,431
G. T. Junction.....	16,238
Chicago & Eastern Illinois.....	10,036
B. O. & C.....	14,512
Lake Shore & Michigan Southern.....	36,334
Michigan Central.....	10,129
Chicago, St. Louis & Pittsburgh.....	44,178
Pennsylvania Company.....	69,175
Chicago & Western Indiana.....	87,942
Holt.....	24,923
New York, Chicago & St. Louis.....	18,756

Sunday Laws.

Rev. W. F. Crafts, of New York City, a prominent man in the "American Sabbath Union," has published a pamphlet summarizing the Sunday laws of the various States of the Union. We condense portions that refer particularly to railroads: California, Alaska, Arizona, Idaho and the District of Columbia have no Sunday laws. In Georgia railroads are permitted to transport delayed

live stock to a stock pen, and to make destination with freight trains, provided the schedule time of arrival be not later than 8 a. m. Freight trains, with these exceptions, are forbidden. Alabama does not forbid "the running of railroads, stages, or steamboats." Colorado does not specifically mention railroads, neither does Delaware. Connecticut forbids the running of trains between sunrise and sunset on Sunday, "except from necessity or mercy." United States mail may, however, be carried except between 10:30 a. m. and 3 p. m., and other trains may be run during the same period, provided the railroad commissioners sanction them as necessary. Handling freight is forbidden unless specially authorized by the commissioners, and in any event labor must cease by 8 a. m. Passengers may be carried on "necessary" trains at "the highest regular fare collected on week days." Florida forbids labor, and the words "either by manual labor or with animal or mechanical power" may cover the case of railroads. Illinois expressly permits railroads and ferries to land their passengers on Sundays. Iowa railroads may be fined for running trains on Sunday. Kansas laws permit ferry service, and say nothing about Sunday trains. Kentucky courts hold passenger and freight trains "works of necessity." Louisiana exempts railroads, telegraph offices and other establishments from the provisions of the Sunday law. Maine forbids unnecessary travel under penalty of a fine. In Massachusetts the railroad commissioners may legalize such trains as they deem necessary. Nebraska sanctions necessary trains. New Jersey's statutes provide "that it shall and may be lawful for any railroad company in this state to run one passenger train each way over their roads on Sunday, for the accommodation of the citizens of this state." Milk can be legally moved on Sunday. Nothing shall impede the carriage of the mails. New Mexico's Sunday law prohibits buying or selling other articles than food and medicine, but is not to be so construed as "to prevent travelers from prosecuting their journey." North Carolina railroads can carry passengers on mail trains, run exclusively passenger trains, or carry live stock and perishable freight. Trains having started on Saturday may run until 9 a. m. to reach their terminus or shops, but for no other purpose. A fine of \$500 can be imposed for violation of the act. Ohio permits families emigrating to travel. Oregon's law implies that railroads can run trains without any molestation. Pennsylvanians traveling on canals or railroads on Sunday cannot compel the companies to expedite their boats or vehicles. Necessaries of life can be delivered before 9 a. m. and after 5 p. m. South Carolina permits fruit and vegetable trains from April to August inclusive, and freight trains in transit which can reach their destination by 6 a. m. Trains unavoidably detained may run to the point where they usually rest upon a Sunday. Texas authorizes the movement of steamboats and railroad trains. Utah's code implies the legality of railroad operations on Sunday. In Vermont the railroad commissioners may authorize through Sunday trains. In Virginia the law provides that if it be necessary to transport live stock or perishable articles in quantity not sufficient to make a whole train load, cars filled with ordinary freight may be added. West Virginia authorizes the running of railroad trains and steamboats. Wyoming railroads are exempt from the Sunday law.

Mr. Crafts commends the Pennsylvania and Vanderbilt lines for their efforts to reduce Sunday work, but adds that the result is "like the case of the tippler who finds that his beer makes him 'dizzy,' and so cuts down his daily allowance from 30 glasses to 27."

A Severe Test of the Rotary.

A new rotary snowplow was given a severe test on the siding at Cascade, Cal., March 23. The snow at that point was found to be 9 ft. deep, and almost as hard as a solid cake of ice. The plow went through the dense mass at the rate of 25 ft. a minute, throwing the snow beautifully far away from the track. A shovel, which had been buried in the drift, was encountered, but the blades took it up and chewed it, iron and all, into fragments, and tossed it out as if they had been used to such diet all the time.

International Exhibition of Mining and Metallurgy in London.

An International Exhibition of Mining and Metallurgy will be held during the summer of 1890 at the Crystal Palace, Sydenham. The Lord Mayor of London is Patron of the Exhibition, and the Honorary President is the Duke of Fife. The list of Honorary Vice-Presidents includes many distinguished names, among them those of Lord Brassey, Sir Frederick Abel, Sir Alexander Armstrong, Sir James Kilsen (President of the Iron and Steel Institute), Sir John Pender, Sir Edward J. Reed and Prof. W. Chandler Roberts-Austen. The scope of the Exhibition will be sufficiently wide to enable a valuable and interesting display to be made. One-half of the surplus of the Exhibition, as certified by the auditors, is to be paid to the exhibitors *pro rata* to the amount paid by them for space occupied, and the other half is to be disposed of by the Council either in founding a Scholarship at the Royal School of Mines or in helping some other institution connected with mining and metallurgy. The Exhibition will open July 2 and close Sept. 30, 1890, and, besides several features of special attraction, important collections of exhibits are expected from the colonies and foreign countries. The Honorary Secretary is Mr. Geo. A. Ferguson, editor of the *London Mining Journal*, 18 Finch Lane, London, E. C., and prospectuses and application forms for space may be obtained of Messrs. Barclay, MacGregor & Co., 45 and 47 Exchange place, New York.

TECHNICAL.

The London Electric Subway.

Recently a demonstration was made of the working of the electro-motives and their two carriage trains on the City and Southwark Subway. For some time these have been at work by means of current supplied by a dynamo and engine, temporarily placed at Great Dover street, near the station in that street on the new line. As it is now proposed to move this plant, the exhibition of the running of the electro locomotives was made, the permanent plant at Stockwell being not yet ready. One of the locomotives used was fitted with two Manchester armatures, each geared by steel pinions to steel idle wheels, which in their turn drive pinions which work the wheels on the driving axles. There is another locomotive in which the armatures are placed direct on the driving axles. The electro-motives weigh about 11 tons, and are proposed for running at a maximum of twenty-five miles per hour, with two long carriages on bogies. The current is conveyed by an iron insulated rail, and taken off by a slipper in front of the locomotive. It is an inverted channel iron on glass

insulators. The locomotive is fitted with the Westinghouse air-brake. It attained a speed of about twenty miles an hour, between King William street and the Elephant and Castle, a distance of a mile and a quarter. The number of visitors carried was about a hundred, and with this load the locomotive dealt easily, the distance from the Elephant to King William street being covered in about five minutes.—*engineer.*

To Reverse Tracings.

A quick way of making reversed tracings of drawings, that is of changing them from right to left hand, is to place them face down on a plate of glass mounted in a frame, and then by putting an electric lamp under the frame a tracing can be made which will be identical with the original, but reversed. This is the manner in which the drawings for the left and right hand stations have been made for the Chicago & South Side Rapid Transit Co.

Railroads in Japan.

N. Tomonari, civil engineer, of Japan, is in America for the purpose of studying railroad construction. A Japanese syndicate, in which the government is interested, with a capital of over \$7,000,000, has been formed for the purpose of developing the coal mines of Northern Japan. The project includes the construction of a railroad system, and this work Mr. Tomonari has in charge.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Minnesota, the Supreme Court holds that the St. Paul Union Depot Co. is not liable to pay, as taxes, a percentage on its receipts or gross earnings. Payment of a percentage on their gross earnings by the railroad companies, which own all the stock and use the terminal facilities of the depot company, constitutes payment of taxes on all the property of the latter.¹

The New Jersey railroad taxation act of 1884 provides by section 12 that each company shall pay to the state a tax at the rate of 1 per centum annually; that each company shall also pay a tax at the local rate, as fixed and assessed for county and municipal purposes upon other property, but the last mentioned rate shall in no case exceed 1 per centum; and that if the addition of the state tax to the local rate as thus limited would compel any company to pay more tax than it would pay if it simply paid the full local rates, then the tax shall be made equal to what it would pay if assessed at full local rates without the state tax. The Supreme Court holds that the local rate to be applied, in determining the amount of tax to be paid by a railroad company, is "the local rate as fixed and assessed for county and municipal purposes upon other property in each taxing district," and not such a rate as would have been sufficient to raise the same revenue in case the valuation of the railroad property had been added to the valuation of the other property in each local assessment.²

In North Carolina the Supreme Court decides that a statute, placing the burden of proving contributory negligence on defendant in actions against railroad companies for injuries through negligence, affects only the remedy, and impairs no vested right, and is constitutional.³

In Wisconsin the Supreme Court rules that a contract between two railroad companies, by which one of them, in consideration of contingent compensation, among other things a part of the grant, agrees to refrain from applying to the legislature for a land grant, and to assist the other in getting it, is void, as against public policy, though it stipulates that the means to be used in securing the grant shall be reasonable and proper.⁴

In New Jersey the Supreme Court decides that the fourth section of the New Jersey railroad taxation act is unconstitutional, being an attempt to substitute, "as a correct standard of value" for railroad property, "the assessed value of the real estate of persons other than railroad or canal corporations," instead of the true value of the railroad property itself, which is the sole basis of a constitutional assessment thereof.⁵

In Georgia the Supreme Court rules that if the terms of a contract between two railroads be agreed upon by correspondence, a limitation or condition inserted in one or more of the communications need not be repeated or referred to in subsequent ones, in order to preserve its force.⁶

Carriage of Goods and Injuries to Property.

In Wisconsin the Supreme Court holds that a side track two miles away from a town, used only to load and unload a single commodity, does not constitute "depot grounds" which, by statute, a railroad is not obliged to fence.⁷

In Minnesota some cattle passed from a road over a cattle guard and were killed on the track. There had been a heavy snow, which had filled the cattle guards, but the railroad was doing its best with a large force of men to remove it. The Supreme Court holds the railroad not liable.⁸

In Dakota the Supreme Court holds that the statute providing that the killing of a horse or any stock by a train along a railroad shall be *prima facie* evidence of the negligence of the railroad company, creates no new liability, but merely changes the order of proof; and recovery cannot be had in an action where there is uncontroverted evidence that the railroad company was not negligent.⁹

In Minnesota the Supreme Court rules that a railroad which takes earth from one part of its premises [for use in the construction of its roadbed, thus leaving an excavation, incurs no liability because the effect of such excavation is to accumulate surface water, and cause it to flow on the lands of an adjoining owner.¹⁰

In New York, the Supreme Court rules that in proceedings to condemn a right of way for a railroad in a street, evidence of damages to adjacent property, caused by the building of the railroad, arising from the fact that the property is used for a particular purpose, is admissible.¹¹

In Colorado, the Supreme Court rules that under the State Constitution, providing that private property shall not be taken or damaged for public or private use without just compensation, plaintiff cannot recover for damages to his property occasioned by the obstruction of a street by a railroad, where the streets and alleys bordering on plaintiff's premises, and by which he gains access thereto, are entirely unobstructed, although, at a short distance from plaintiff's house, a street which plaintiff has occasion to use more than any one else is so obstructed.¹²

In New York the Supreme Court holds that under the statute providing that railroad companies shall maintain fences with openings, bars, or gates at farm crossings, "for the use of the proprietors of the land," where a gate is so maintained by a railroad company it is the

duty of the owner of the land to close the gate after using it.¹³

In Nebraska the Supreme Court rules that where it appears that the corporate limits of a city, with buildings thereon, extend along one side of the various side tracks of a railroad, the land on the other side not being platted; that the side tracks thus established are necessary and proper for the transaction of the business of the railroad; and that it would be inconvenient and unsafe to the employes of the company if a cattle-guard and fence were erected—the railroad company is not required to fence its tracks at that point, and will not be liable for stock killed by its engines and cars at that place unless guilty of negligence.¹⁴

Injuries to Passengers, Employes and Strangers.

In Louisiana the Supreme Court holds that a railroad is liable for personal injuries to passengers resulting from the derailling of a train caused by rotten cross-ties. But although it is guilty of negligence in maintaining rotten cross-ties on its roadbed whereby a train is derailed and passengers are injured, it will not be held liable for exemplary damages, where it appears that the cross-ties usually last six years, that the road had not been operated more than four years, and that at the time of the accident the company was actively engaged in replacing decayed ties with new ones.¹⁵

In Mississippi the Supreme Court rules that a railroad is not bound to stop its train at a point other than a station, and where its trains are not accustomed to stop, unless it makes a special contract to carry to that point. In this case the ticket agent at M. refused to sell plaintiff a ticket to R, because R. was not a stopping place. Plaintiff then entered the train, and told the conductor that she wished to go to R. He collected 25 cents, and told her that the train did not stop at R. Twenty-five cents was the prescribed fare for any distance not exceeding eight miles. W., the nearest stopping place, and also R., were within eight miles of M. The Supreme Court holds that there was no special contract to carry to R.¹⁶

In Minnesota the Supreme Court rules that it is negligent and unwarrantable conduct on the part of a conductor in charge of a train to notify or advise a passenger to leave the train while in motion, under circumstances likely to expose him to accident or injury.¹⁷

In Delaware the Supreme Court holds that railroads are bound to provide safe and convenient means of approach to their stations for all who take their trains as passengers, and of departure for those leaving them; and, as a part of this obligation, the stations must be sufficiently lighted, and kept lighted until all passengers have had a reasonable time afforded them to reach a safe public thoroughfare by the aid of such lighting, if needed, or unless a guide be furnished for the purpose by the company.

Where a passenger alighting at a railroad station is a stranger to the station and surroundings, and finds himself, almost immediately after alighting from a train, left in utter darkness by the extinguishment of the station light by the agent of the railroad, the railroad cannot claim that the passenger is a wrong-doer if he, in his effort to get to a place of safety or for information, crosses other ground of the defendant than that upon which the station is actually erected.¹⁸

In New York while the plaintiff was at the side of certain cars, which were being unloaded of earth and gravel by means of a "plow," the plow fell over the side of the car, and injured him. The plow had been used for five years, without any injury resulting therefrom, and plaintiff failed to show why the plow fell, but defendant's evidence tended to show that it was thrown off by a stone that had lodged between two of the cars, and it appeared that it had frequently fallen before from a similar cause. The plow was pulled by the locomotive, and the whistle was usually blown when it started, but on this occasion it was not. The Supreme Court holds the railroad liable.¹⁹

In Georgia a boy of 17, while loading an open flat-car with lumber, was injured by some of the lumber falling upon him. There was no evidence that the doing of such work properly was dangerous, or that he did not know how to do it properly, or that he was wanting in capacity to know, and nothing was alleged in the declaration as to any defect in the car or any of the appliances. The Supreme Court holds that the boy cannot recover damages from the railroad.²⁰

In the same State the Supreme Court holds that where the plaintiff was injured by using a ladder made by a workman under him, whom he knew to be inefficient, evidence of promises made by a person representing defendant that such workman should be discharged as soon as possible, by which promises plaintiff alleges he was induced to remain in defendant's service, is irrelevant.²¹

In New York, in an action for the killing of a switchman by lumber falling on him from a car, it appeared that the car was strong, and capable of holding the timbers loaded on it; that such cars were in general use for that purpose; that defendant furnished suitable stakes for securing the lumber, and competent inspectors to superintend the loading; and that the cause of the accident was the manner in which the car was loaded by decedent's co-employees, the lumber being piled higher than boxes around the edge of the car, and the stakes not being used. The Court of Appeals holds the railroad not liable.²²

In Pennsylvania the plaintiff, by the invitation of another, was riding with him in his wagon. He knew the locality, and that he was approaching a railroad crossing, and that a train was due. He sat with his back to the driver, approaching the crossing at a fast trot; and, though he might have seen his danger, he did not look, or warn the driver, or ask him to stop and listen, or take any precaution whatever. The Supreme Court rules that he cannot recover for injuries received in a collision with the train.²³

In Louisiana the Supreme Court holds that it is not contributory negligence to jump on a railroad track immediately in front of an approaching train to rescue the life of another, where plaintiff believed that he could save the life of the person in danger and avoid injury himself, and it appears that he would not have been harmed had not the train been running at a high rate of speed.²⁴

In Michigan and Georgia, the Supreme Courts rule that due care according to age and capacity is all the law exacts of a child of tender years. Ordinary care, which is that of every prudent man, is not the standard for a child.²⁵

In New York several of the defendant's tracks crossed the road where the accident occurred; plaintiff stood and waited for a west-bound train to pass, and then in crossing the tracks was struck by an east-bound train; before crossing plaintiff looked both ways and saw no train approaching. The evidence as to ringing the bell and blowing the whistle of the east-bound train was con-

flicting. The track could be seen for a long distance, looking west. The west-bound train made considerable noise. There was a head-light on the east-bound train, but there was a switch-engine with a head-light standing near, and various other lights at different points along the tracks. The night was dark and hazy. The Supreme Court holds the railroad liable.²⁶

- ¹³State v. St. P. U. D. Co., 43 N. W. Rep., 840.
- ¹⁴Williams v. State Assessors, 18 Atl. Rep., 750.
- ¹⁵Wallace v. W., N. C. R. Co., 10 S. E. Rep., 552.
- ¹⁶C. V. & S. R. Co. v. C. St. P. & M. R. Co., 44 N. W. Rep., 17.
- ¹⁷Williams v. Assessors, 18 Atl. Rep., 750.
- ¹⁸Georgia R. & B. Co. v. Smith, 10 S. E. Rep., 235.
- ¹⁹Taylor v. C. M. & St. P. R. Co., 43 N. W. Rep., 723.
- ²⁰Stacey v. W. & St. P. R. Co., 43 N. W. Rep., 903.
- ²¹Huber v. C. M. & St. P. R. Co., 43 N. W. Rep., 819.
- ²²Jordan v. C. M. & St. P. R. Co., 43 N. W. Rep., 849.
- ²³re Union E. R. Co., 1 N. Y. (Supp.), 853.
- ²⁴Gilbert v. G., S. L. & P. R. Co., 22 Pac. Rep., 814.
- ²⁵Diamond Brick Co. v. N. Y. C. & H. R. Co., 7 N. Y. Supp., 888.
- ²⁶C. B. & Q. R. Co. v. Hogan, 43 N. W. Rep., 1148.
- ²⁷Rutherford v. S. & H. R. Co., 6 South. Rep., 644.
- ²⁸Wells v. Ala. G. S. Ry. Co., 6 South. Rep., 737.
- ²⁹Jones v. C. M. & St. P. R. Co., 43 N. W. Rep., 1,111.
- ³⁰Wallace v. W. & N. R. Co., 18 Atl. Rep., 818.
- ³¹De Van v. P. & N. Y. C. & H. R. Co., 7 N. Y. Supp., 892.
- ³²Sinus v. E. & W. R. Co., 10 S. E. Rep., 543.
- ³³Bolton v. So. Pac. R. Co., 10 S. E. Rep., 352.
- ³⁴Ford v. L. S. & M. S. R. Co., 22 N. E. Rep., 946.
- ³⁵Dean v. Penn. R. Co., 18 Atl. Rep., 718.
- ³⁶Peyton v. T. & P. R. Co., 6 South. Rep., 690.
- ³⁷Wright v. D. G. H. & M. R. Co., 43 N. W. Rep., 765; W. & A. R. Co. v. Young, 10 S. E. Rep., 197.
- ³⁸Beckwith v. N. Y. Cent. & H. R. Co., 7 N. Y. Supp., 719.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Central of Georgia, quarterly, 2½ per cent., payable April 15.
- Delaware, Lackawanna & Western, quarterly, 1¼ per cent., payable April 21.
- Long Island, quarterly, 1 per cent., payable May 1.
- Missouri Pacific, quarterly, 1 per cent., April 15.
- New Castle & Beaver, quarterly, 2½ per cent., payable April 1.
- Non-folk & Western, 1½ per cent. on the preferred stock, payable April 24.
- Pittsburgh, Fort Wayne & Chicago, quarterly, 1½ per cent., and quarterly, special, 1½ per cent., payable April 1.
- Raleigh & Gaston, 3 per cent., payable April 1.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

- Adirondack, annual, New York City, April 15.
- Allegheny Valley, annual, Pittsburgh, Pa., April 8.
- Ashbourne, Cheltenham & Philadelphia, special, Philadelphia, Pa., April 5.
- Chesapeake, Ohio & Southwestern, annual, Louisville, Ky., April 7.
- Chicago & Alton, annual, Chicago, Ill., April 7.
- Chicago & Grand Trunk, annual, Chicago, Ill., April 9.
- Chicago, Rock Island & Pacific, annual, Chicago, Ill., June 4.
- Chicago, St. Louis & Pittsburgh, annual, Union Depot, Indianapolis, Ind., April 9.
- Chicago & West Michigan, annual, Muskegon, Mich., April 6.
- Colorado Midland, annual, Colorado Springs, Col., April 7.
- Dallas Terminal, annual, Cockrell Building, 825 Main street, Dallas, Tex., April 5.
- East Tennessee, Virginia & Georgia, special, Knoxville, Tenn., April 15.
- Joliet & Chicago, annual, Chicago, Ill., April 7.
- New York Central & Hudson River, annual, Grand Central Station, New York City, April 16.
- Tenino-outta, special, St. Louis Hotel, Quebec, April 9, to act upon a proposed issue of bonds.
- Texas & Pacific, annual, Dallas, Tex., April 15.
- Panama, annual, 17 Broad street, New York City, April 7.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

- The General Time Convention will hold its next meeting at the Hotel Brunswick, New York City, April 9.
- The Association of American Railway Accounting Officers will hold its next annual meeting at the Stockton Hotel, Cape May, N. J., July 9.
- The Master Car Builders' Association will hold its next annual convention at Old Point Comfort, Va., June 10. Rooms should be secured of Mr. F. N. Pike, manager, Hygeia Hotel, Fortress Monroe, Va.
- The American Railway Master Mechanics' Association will hold its next annual convention at Old Point Comfort, Va., in June.
- The National Association of General Baggage Agents will hold its next annual convention at Chicago, Ill., July 16.
- The Traveling Passenger Agents' Association will hold its next annual convention at Buffalo, N. Y., August 19.
- The New England Roadmasters' Association will hold its eighth annual meeting at Boston, Mass., Aug. 20 and 21.
- The New England Railroad Club meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.
- The Western Railway Club holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.
- The New York Railroad Club meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.
- The Central Railway Club meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.
- The Northwest Railroad Club meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.
- The Northwestern Track and Bridge Association meets on the Saturday following the second Wednesday of each month at 7:30 p. m. in the director's room of the St. Paul Union station, except in the months of July and August.

The American Society of Civil Engineers holds its regular meeting on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The Boston Society of Civil Engineers holds its regular meetings at Boston, at 7:30 p. m., on the third Wednesday in each month. The next meeting will be held at the American House.

The Western Society of Engineers holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The Engineers' Club of St. Louis holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The Engineers' Club of Philadelphia holds regular meetings at the house of the Club, 1,122 Girard street, Philadelphia.

The Engineers' Society of Western Pennsylvania holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The Engineers' Club of Cincinnati holds its regular meetings at 8 p. m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The Civil Engineers' Club of Cleveland holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the Fourth Tuesday of the month.

The Engineers' Club of Kansas City meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The Engineering Association of the Southwest holds regular meetings on the second Thursday evening of each month at 8 o'clock, at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The Civil Engineers' Society of St. Paul meets at St. Paul, Minn., on the first Monday in each month.

The Montana Society of Civil Engineers meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The Civil Engineers' Club of Kansas holds regular meetings on the first Wednesday in each month at Wichita, Kan.

American Society of Civil Engineers.

At the meeting of the Society last Wednesday night the result of the letter ballot on discharging the special committee on standard rail sections was announced. The committee was continued.

It was also decided by letter ballot to appoint a committee on units of measurement.

The following were elected:

Members: James Henry Covode, engaged in railroad construction in Chili, South America; George Stewart Davison, Chief Engineer and Superintendent P. C. & Y. Railroad, Pittsburgh, Pa.; Peter Conover Hains, Lieut. Col. Corps of Engineers, U. S. A., Washington, D. C.; Alexander William Jardine, Acting Engineer-in-Chief Harbors and Rivers, Queensland, Australia; Thomas Henry McCann, Civil Engineer and Architect, Hoboken, N. J.; Gaylord Thompson, Assistant Engineer in charge Section 8, New Croton Aqueduct, Yonkers, N. Y.

Associate: Lewis Roberts Pomeroy, special Agent for Messrs. Carnegie, Phipps & Co. (Limited), of Pittsburgh, Pa., at New York City.

Juniors: Robert Walter Cruzebauer, Engineer for New York Underground Railroad, address, Brooklyn, N. Y.; Charles William McMeekin, Des Moines, Iowa.

Central Railway Club.

At the next meeting of this club the following will be the subjects:

"Counterbalances of Locomotives; best rules of practice. What effect the use of an engine not properly counterbalanced has on the draft gear of cars." Committee, W. A. Foster, J. H. Murphy and James Macbeth. "From what system of car inspection are best results obtained, viz.: Joint inspection, in which the expense of labor is jointly borne by the several companies interested; or, straight inspection in which the labor is employed wholly by the receiving or disbursing companies, the report to cover points of economy in expenditure, protection for the companies for which the inspection is made, and dispatch of freight in transit." Committee, H. M. Waite, F. Sutherland, J. R. Petrie, P. Smith, and E. D. Gronner.

Engineers' Club of Kansas City.

Friday evening, Feb. 28, the club held its annual dinner at the St. James Hotel. There were 33 present, including 22 members and invited guests. Toasts were responded to by President W. H. Breithaupt, O. B. Gunn, F. E. Sickels, K. Allen, A. J. Mason, G. W. Pearsons and D. W. Pike, and entertaining reminiscences of engineering experience were given by Mayor Davenport, Major Gunn, Mr. E. I. Farnsworth and Mr. Henry Goldmark. Mr. Wm. B. Knight was toast master.

A regular meeting was held in the club room March 3. President Breithaupt in the chair, K. Allen, Secretary, 14 members and three visitors being present.

It was voted that regular meetings be hereafter held on the second Monday of the month.

The secretary presented in behalf of Mr. Thomas a large number of valuable government reports. Edward J. Lawless was proposed as an Associate and Carl Wenwetrock as a Member.

Mr. G. W. Pearsons read a paper on "Photography Applied to Surveying." He said in part: "The focal length of camera best adapted to this work is from 12 to 15 in. The image formed on the sensitive plate represents a series of right lines passing through the centre of the lens from the landscape to it. If, therefore, the plate is in correct position it will give a mathematically correct copy, capable of direct measurement, and to a much greater degree of accuracy than would be at first imagined. For purposes of precision proper regard must be paid to the positions of the plate and camera. The former must be truly vertical, and, for a proper definition of the horizon, its edges should be horizontal. The angle covered by the plate must be known, and sufficient lap should be allowed to join consecutive prints. The centres of plates should be correctly located, vertically and horizontally, as they must be measured by a scale of tangents from the vertical centre and horizon. The focal distance should remain fixed.

"After taking a series of views from the first station, proceed to the next point and take another set in the same manner, intersecting the first. The points of observation being known, these intersections determine any desired point in the field of view. Third station bears on the first two, the fourth on the second and third, etc., forming a continuous triangulation on which most points may be defined by three intersections. Any point so determined is also defined as to height by the tangent of its distance from the point of observation. The plates, therefore, give vertical as well as horizontal definitions of the field and with a degree of accuracy which will surprise the engineer."

At the meeting on April 14 papers will be read on

"Bridge Substructure in the Kansas River," by E. I. Farnsworth, and "Draw Bridges as closed by Water Power," and "River Motors as used in Europe," by S. N. Stewart."

New England Railroad Club.

The annual meeting of the Club will be held at the United States Hotel, Boston, April 9, at 7:30 p. m. The subject for discussion is Locomotive Boilers.

Northwest Railroad Club.

The next meeting of the Northwest Railroad Club will be held in the Directors' Room of the Union Depot, St. Paul, April 5, at 7:30 p. m. The subject for discussion is, "Brasses—Car, Driving and Rod." To be introduced by Mr. J. L. Grentsinger, of the Duluth & Iron Range Railroad.

PERSONAL.

—Mr. Clem. Hackney has associated himself with the Standard Journal Bearing Co., of Chicago, as President and General Manager.

—Mr. Frederic Graff, hydraulic engineer and a past president of the American Society of Civil Engineers, died in Philadelphia this week.

—Mr. G. M. Beach, formerly General Manager of the Cleveland, Columbus, Cincinnati & Indianapolis, but since last June General Manager of the Chicago & Atlantic, has resigned this position.

—Mr. Charles A. Ball, who has resigned his position of General Superintendent of the Georgetown & Western, was presented with a handsome gold cane by the employés of the road last week on his departure for New York.

—Mr. Eppes Randolph, Chief Engineer, and E. Hildgard, Principal Assistant Engineer, in charge of construction of the Covington & Cincinnati Elevated Railroad & Bridge Co. and the Chesapeake & Ohio terminals in Cincinnati, have resigned.

—Mr. W. F. Ellis, Engineer and Roadmaster of the New York, Providence & Boston, has resigned, to accept a position with the Dunham Manufacturing Co., in the interest of the Servis tie plate and Davies lock spike, of which he has always been a strong advocate.

—Mr. Lewis S. Greves, General Eastern Freight Agent of the West Shore, has resigned that position to accept the General Eastern Agency of the Great Northern, with office in New York City. Brainard Howell, of the West Shore, succeeds Mr. Greves as General Eastern Freight Agent of that road.

—Mr. J. Murray Africa, who became General Manager of the Chautauqua Lake road last July, has resigned that position to become General Manager of the Etowah Iron Co., of Georgia. Mr. W. E. Griggs has been appointed General Superintendent to succeed him, in addition to his duties as General Freight and Passenger Agent.

—Mr. Cecil Gabbett has resigned the position of General Manager of the Atlanta & Florida, which he accepted last August. He has found this step necessary as his duties as General Manager of the Central of Georgia require his entire attention. Mr. Thomas J. Garrett, formerly of the East Tennessee, Virginia & Georgia, has been appointed Superintendent to succeed Mr. Gabbett.

—The employés of the roadway department of the New York, New Haven & Hartford, under the supervision of Mr. J. S. Lane, Division Roadmaster, who recently resigned to engage in business for himself, met at the Union Station in Hartford last Monday and presented him with a handsome gold watch and chain, gold-headed cane and a silver table service of 110 pieces. Mr. Lane's successor as Roadmaster is Mr. Edward K. Post, a former employé of the company, but who for the past few years has been Division Roadmaster on the New York & New England.

—Mr. Thomas Cornell died at his residence, in Rondout, N. Y., March 29, of pneumonia, after a short illness, aged 76 years. In 1843 Mr. Cornell engaged in the steam transportation business on the Hudson River, and the business finally developed into the Cornell Steamboat Co., of which he was President. He was interested in several railroads and in a number of banks in towns along the Hudson River. The first railroad with which he was connected was the Bennington & Rutland, which he helped to build. He was the President and largest stockholder of the Ulster & Delaware, Kaaterskill and Delaware & Otsego roads. He was for several years a director of the Delaware & Hudson Canal Co. and was President of the Rhinebeck & Kingston Ferry Co.

—Mr. David Dows, one of the best known business men of New York City, and head of the grain commission house of David Dows & Co., died at his home in New York, March 30. He was born at Charlton, N. Y., in 1814, of a family which was prominent in New England during the colonial days and which had taken part in the first settlement of Boston. Mr. Dows was interested in a large number of railroads and financial companies, and he negotiated large loans for the federal government during the war. Mr. Dows was one of the founders and principal stockholders of the Fourth National Bank in New York, was Vice-President of the Chicago, Rock Island & Pacific, a director of the Union Pacific, of the Delaware & Hudson Canal Co., Chicago, Milwaukee & St. Paul, Chicago, St. Paul, Minneapolis & Omaha and other roads; of the National Exchange Bank, Fourth National Bank, Central Trust Co., Merchants' National Bank of New York, Union National Bank of Chicago, President of the New York Corn Exchange, before its consolidation with the Produce Exchange, and a prominent and active officer of the Produce Exchange. His estate is valued at \$20,000,000.

ELECTIONS AND APPOINTMENTS.

Astoria, Seashore & Eastern.—The incorporators of this Oregon road are: W. H. Smith, Oliver Stewart, E. C. Jeffers, D. M. Stewart, Astoria, and George Eckler, Dayton, Wash., and D. M. Stewart, Astoria, Wash.

Atchison, Topeka & Santa Fe.—W. E. Castella has been appointed Superintendent of the Kansas City division of the lines east of the Missouri River, with office at Fort Madison, Ia., vice C. L. Nichols, resigned.

Atlantic & Danville.—N. H. Stevens having resigned the superintendency of this company, the duties of that office have been assumed temporarily by A. D. Bateman, Assistant General Manager.

Atlantic & Pacific.—After May 1 the general offices of this company, embracing the offices of the President, Secretary and Treasurer, General Solicitor, Auditor and Land Commissioner, will be located in the Mills Building, No. 15 Broad street, New York.

Bennington & Rutland.—S. B. Hall has been appointed Assistant Treasurer of this company, and until further notice will assume all the duties of the treasurer in charge of that department.

Boise Central.—The first Board of Directors is as follows: C. W. Moore, President; John Broadbent, Vice-President; Nathan Falk, Treasurer; John Lemp, Peter Sonna, James A. Pinney, R. Z. Johnson, F. R. Coffin, Thomas Davis, Wm. H. Ridenbaugh and H. B. Eastman all of Boise City, Idaho.

Burlington & Missouri River.—H. C. Nutt, Jr., has been appointed Trainmaster of the Wyoming division, with headquarters at Alliance, Neb.

Cape Fear & Yadkin Valley.—J. W. Fry, heretofore General Superintendent, has been appointed General Manager of this company, and will have charge of the traffic, maintenance and operating departments.

Central New England & Western.—W. J. Cromwell has been appointed Purchasing Agent, with office at No. 115 Broadway, New York.

Central of New Jersey.—John T. Pritchard has been appointed Assistant Treasurer, with office in New York City.

Charleston, Sumter & Northern.—M. Wood has been appointed Superintendent of the road department, with office at Vance's, S. C.

Chautauqua Lake.—W. E. Griggs, General Passenger and Freight Agent, has been appointed General Superintendent in addition to his former duties, with office at Jamestown, N. Y.

Chesapeake & Ohio.—C. H. Dent has been appointed Freight Claim Agent, with office at Cincinnati.

Chicago, Fort Madison & Des Moines.—The directors of this company, the reorganized Fort Madison & Northwestern, are: Willard T. Block, E. S. Conway, Buren R. Sherman, A. E. Whitney, William P. Scott, Frank A. Seymour, S. Atlee, E. S. Skinner and James A. Parmelee. W. P. Scott is General Manager.

Chicago Freight Bureau.—E. J. Hutchinson, for several years Chief Clerk, has been appointed Auditor of the organization.

Chicago, Milwaukee & St. Paul.—Superintendent C. A. Goodnow has been transferred to the Chicago & Council Bluffs Division, in Iowa, to succeed R. B. Campbell, resigned. Superintendent J. W. Stapleton has been transferred to the Dubuque Division. The jurisdiction of D. L. Bush, Superintendent of the Hastings & Dakota Division, has been extended, to cover the James River Division.

P. F. Malone, Roadmaster at Aberdeen, N. D., has been transferred to Sioux City, Ia., to succeed J. A. Crippen, resigned.

Chicago, St. Paul & Kansas City.—John I. Banks has been appointed Superintendent of Bridges, Buildings and Water Supply, with headquarters at Dubuque, vice C. H. Eggers, resigned.

Cincinnati & Northwestern.—W. T. Simpson has been appointed Secretary, with office in Cincinnati, in place of F. H. Simpson.

Cincinnati & Richmond.—The directors of the consolidated company are: J. N. McCullough, Thomas D. Messler and James McCrea, of Pittsburgh; J. L. Brooks, of Saline, O.; J. E. Neal, of Hamilton, O.; D. S. Gray, of Columbus, O., and John F. Miller, of Richmond, Ind. The officers are: President, T. D. Messler; Secretary, L. B. Liggett, of Pittsburgh; Treasurer, John E. Davidson, of Pittsburgh.

Cleveland, Cincinnati, Chicago & St. Louis.—The following appointments have been made: E. E. Kruthoffer, Chief Freight Accountant, and Iri Reynolds, Chief Ticket Accountant. The resignation of B. F. Whitman, who has had charge of these departments, took effect April 1. Mr. Kruthoffer has been Traveling Auditor and Mr. Reynolds has been Chief Clerk to Mr. Whitman for several years. J. W. Hewitt, Assistant Traveling Auditor, has been promoted to the position vacated by Mr. Kruthoffer.

Denver & Rio Grande.—Alexander Struthers has been appointed Master Mechanic, in charge of the Machinery and Car Department at Grand Junction, Col. B. H. DeRemer has been appointed Master Mechanic of the Second Division, with headquarters at Leadville, Colo., vice Alexander Struthers transferred.

Duluth & Iron Range.—H. S. Bryan has been appointed Master Mechanic of the road, with headquarters at Two Harbors, Minn.

East Tennessee, Virginia & Georgia.—E. M. Roberts, Master Mechanic of the Ashland Coal & Iron Railway Co., has resigned to accept the position of Master Mechanic of the Georgia Division of this road at Atlanta, Ga.

Fort Worth & Belt Line.—The charter has been filed in Texas by E. W. Taylor, J. P. Smith, W. F. Sommerville, A. B. Smith, W. A. Adams, J. F. Swayne, all of Fort Worth, and G. M. Dodge and J. T. Granger, of New York.

Grand Rapids, Chicago & St. Louis.—The following directors have been elected by this company, which was formerly known as the Grand Rapids & Lake Michigan: W. C. Tolford, E. E. Temple, C. W. Garfield, C. H. Hall, of Grand Rapids; W. S. Farmer, George B. Tatman, of Benton Harbor; A. S. Dyckman of South Haven; George P. Hummer, J. C. Post and P. H. McBride of Holland. The Directors elected the following officers: W. D. Tolford, President; E. E. Temple, Vice-President; C. W. Garfield, Secretary; and C. H. Hall, Treasurer.

Kansas City, Wyandotte & Northwestern.—Newman Erb, Vice-President and General Manager, has been appointed Receiver, with office in Kansas City. E. Summerfield, General Superintendent, has been appointed General Manager, and will have charge of the traffic and operating departments of the company.

Kent & Lambton.—The incorporators of this road are: James W. Steinhoff, William D. McRae, Harvey Morris, Thomas B. Gillard, George Mitchell, William Whitebread, Alfred S. Chamblau, Thomas Redpath, Joseph C. Shaw, Daniel Doble, John Langworth, William K. Snyder and John S. Fraser.

Lackawanna & Southwestern.—The following are now the officers of this road: Edward Mahoney, President, 48 Wall street, New York; Geo. D. Chapman, Vice-President, 48 Wall street, New York; W. H. Badger, General Superintendent, Angelica, N. Y.; M. S. Blair, Auditor and Assistant Treasurer, Angelica; C. H. Hammond, General Freight and Passenger Agent, Angelica.

Lake Erie, Essex & Detroit River.—D. H. Dotterer, having resigned as Superintendent and Master Mechanic, William Woollett has been appointed General Superintendent in addition to his present office of Traffic Manager. C. C. Young has been appointed Superintendent of Transportation in addition to his duties as Train Dispatcher. S. Austin has been appointed Mechanical Superintendent. The general office is at Walkerville, Ont.

Lebanon & Reading.—The incorporation of this company by officers of the Pennsylvania was referred to last week. The directors are: J. N. Du Barry, R. D. Barclay, William H. Barnes, John P. Greene, W. A. Patton, N. P. Shortridge and Henry D. Welsh, all of Philadelphia.

Little Miami.—W. Gibson has been appointed Engineer of Maintenance of Way of the road, to succeed W. B. Leeds, appointed Division Superintendent of the Chicago, St. Louis & Pittsburgh.

Louisville Southern.—W. R. Woodard, General Superintendent of the Louisville, New Albany & Chicago, has been appointed General Manager of this road, with office in Louisville, Ky.

Michoucan & Pacific.—The officers of this Mexican road are: President, Robert R. Symon; General Manager, George G. Baird, La. Trojes, Angangueo; General Superintendent, L. R. Gordon, Maravatio; Chief Engineer, Arthur P. Herbert, Maravatio, and Secretary, Thomas Adams, Las Trojes.

Millan & Southern.—The incorporators of this Georgia road are: William B. Stillwell, of Savannah; Loring R. Miller, New York City; Lemmet Johnson, of Ware county, and James W. Preston, of Effingham county.

Missouri, Kansas & Texas.—William Flannely has been appointed Canadian Passenger Agent of this road, with headquarters at Toledo, O., vice Thomas Dorwin, resigned.

New York, Lake Erie & Western.—George A. Coe has been appointed Special Agent of this company, with headquarters at Pittsburgh, Pa., and will have charge of such duties as may be assigned him by the Superintendent of Transportation. Mr. Coe has been Chief Train Dispatcher of the Michigan Division of the Lake Shore & Michigan Southern, and was formerly Train Master of the Franklin Branch of the road.

W. L. Derr has been appointed Superintendent of the Jefferson branch, with office at Carbondale, Pa.

New York & Northern.—H. F. Dimock has been elected Vice-President, with office at No. 32 Nassau street, New York, in place of George J. Forrest, deceased.

Norfolk Southern.—W. W. King has been appointed Trainmaster, with office at Norfolk, Va., to relieve the Roadmaster, who will hereafter devote his entire attention to the road department.

Norfolk & Virginia Beach.—S. B. Shoemaker has been appointed General Passenger Agent with office in Norfolk, Va.

Northern Pacific.—I. A. Nideau has been appointed General Agent at Seattle, Wash., to succeed T. H. Tyndale, in addition to his duties as Assistant Superintendent.

Northwestern Monroe.—A partial list of the officers elected at the recent annual meeting was published last week. The road is three miles long. The following is a complete list of the officers elected: G. E. St. John, President, Clinton, Ohio; C. W. French, Vice-President and General Manager, Mansfield, O.; E. H. Zurhorst, Vice-President and General Freight Agent, Sandusky; H. A. Blair, Assistant General Freight Agent and Master of Transportation, Mansfield; S. A. Jennings, Secretary, Mansfield; R. Brinkerhoff, Treasurer, Mansfield; U. T. Curran, Auditor, Sandusky; Victor A. Dehnell, Assistant Auditor, Mansfield, and Wolfe & Henry, General Counsel, Mansfield.

Oxford & Clarksville.—At a meeting of the stockholders at Oxford, N. C., last week, Col. A. B. Andrews was elected President; J. M. Currin, R. V. Minor and W. A. Babbitt, of Oxford, and J. S. Carr, S. T. Morgan and B. L. Duke, Durham, were elected Directors, and Maj. N. A. Gregory, of Oxford, Secretary.

Pennsylvania Co.—John B. Brittain has been appointed special agent of the accounting department of this company, and of the Pittsburgh, Cincinnati & St. Louis, and the Chicago, St. Louis & Pittsburgh, vice R. R. Morris, deceased.

Port Townsend Southern.—The new board of directors has elected these officers: President, Elijah Smith, Mills Building, New York City; Vice-President, H. W. McNeill, of Seattle, Wash.; Treasurer, H. McLellan, who is Secretary of the Oregon Improvement Co.; Superintendent of Construction, F. A. Hill, Port Townsend, Wash., and Chief Engineer, J. B. Hogg, Port Townsend.

Rome & Decatur.—J. R. Taylor has been appointed General Manager to succeed Maj. George D. Lawrence, resigned. Mr. Taylor has been in the service of the Atlanta & West Point, Western of Alabama and Queen & Crescent. He was Superintendent of the Pine Bluff, Monroe & New Orleans, and later was executive secretary to the President of the Mexican National.

St. Clair, Madison & St. Louis.—These are the incorporators and first board of directors of this recently chartered Illinois road: H. M. Hill, F. M. Horner, John McIntire, of East St. Louis; George S. Drake and Alvah Mansur, of St. Louis.

St. Louis, Alton & Terre Haute.—George E. Lary has been appointed General Freight & Passenger Agent of the lines operated by this company, to succeed B. F. Blue, resigned to engage in other business.

Savannah, Americus & Montgomery.—E. S. Goodman has been elected General Freight and Passenger Agent, and W. E. Hawkins has been appointed Assistant to the President, both with office at Americus, Ga.

Toledo, Ann Arbor & North Michigan.—J. B. Connors has been appointed Superintendent, with headquarters at Owosso, Mich.

Union Pacific.—D. O. Clark, General Coal Agent, having resigned, C. H. McKibbin, General Purchasing

Agent, will, until further notice, have full charge of the sale, distribution and assignment of coal and other fuel. E. C. Connor has been appointed Timber and Fuel Agent. The office of Tie and Timber Agent has been abolished. The office of General Coal Agent has been abolished. The Timber and Fuel Agent will report direct to the General Purchasing Agent.

Valley (Ohio).—Chas. A. Witzell has been appointed Freight Agent, succeeding Mr. A. R. Gibson, resigned. Mr. Witzell has been in the employ of the company about ten years, most of that time as Chief Clerk of the passenger department.

Wabash.—C. Sheehy, for many years Canadian Passenger Agent of this company, having resigned to enter the service of the Canadian Pacific as District Passenger Agent at Detroit, Mich., J. A. Richardson has been appointed Canadian Traveling Agent, with headquarters at No. 28 Adelaide street east, Toronto, Ont.

Washington Southern.—J. N. Du Barry has been elected President of the reorganized road, and Charles Pugh, General Manager.

West Virginia Central.—The company has been reorganized under its new charter, and at a meeting held in Philadelphia, March 27, these directors were elected: Alexander Bondron, F. P. Noble, Amos K. Kepner, Fred T. Clark, A. Bierbauer, Silas K. Kraver and Josiah W. Aucott. A. Bondron was elected President and Treasurer, F. L. Clark, Secretary, and H. C. McWhorter, of Charleston, W. Va., Vice-President.

Whitefield & Jefferson.—On account of the purchase of the interest of the Brown Lumber Co. in the road by the Concord & Montreal, Warren G. Brown and Ossian Ray have resigned as directors of the former. The number of directors has been reduced from eight to seven, and L. C. Pattee, of Enfield, N. H., has been elected a member of the board.

Wichita Valley.—These officers have been elected: President, Morgan Jones, Fort Worth, Tex.; Secretary, J. Grant Jones, Wichita Falls, Tex.; Treasurer, E. W. Taylor, Fort Worth, and Chief Engineer, P. H. McCrickett, Wichita Falls.

Charles Moffatt, passenger conductor on the Fort Worth & Denver City, has been appointed Superintendent of Construction.

Yemassee & Walterboro.—The following are the officers of this road: President, R. C. Barkley, Charleston, S. C.; Treasurer, A. Wichman, Walterboro, S. C., and Chief Engineer, Gordon Gairdner, Augusta, Ga.

Zanesville & Ohio River.—The office of Foreman of Engines and Cars has been abolished and Nathan Wright has been appointed Master Mechanic, with office at Fair Oaks (P. O. Zanesville), O.

OLD AND NEW ROADS.

Astoria, Seashore & Eastern.—The company has been incorporated in Oregon with a capital stock placed at \$300,000. The company proposes to cover a vast area of territory. The articles of incorporation cover lines from Astoria to Smith's Point and Fairfield, thence south across Young's Bay to its southerly shore, southerly to Fort Clatsop, on the Lewis and Clark River, thence northwesterly to Smith's Lake and Tansy Point, and south along the Necanicum and the Necanicum creeks to the Seaside House; up the Necanicum River to the north fork of the Nehalem River to Tillamook Bay, thence south along the coast of Oregon. Branches are to be built to Portland and points in the Willamette Valley.

Atchison & Nebraska.—The referee in the case brought by the Attorney-General of Nebraska, to declare a forfeiture of the franchise of the road on account of alleged violations of the constitutional prohibition against the consolidation of parallel and competing lines, has been taking testimony in Lincoln the past few weeks, and has heard the direct evidence of the state.

Baltimore & Ohio.—The Governor of Maryland signed the bill to authorize the Mayor and City Council of Cumberland to issue city bonds to the amount of \$150,000, and to loan the proceeds to this company for a stated period. The bill also authorizes the city to guarantee the principal and interest of an issue of bonds of the road, for a like amount, if the city government so decides.

Bellefontaine & Buffalo Run.—It is reported that this company will shortly begin an extension from the present terminus at State College, Pa., to Stone Valley, in Huntingdon County, a distance of about 12 miles. Collins Bros., of Bellefontaine, will probably be awarded the contract for grading.

Boise Central.—The charter of this company has been filed in Idaho. It proposes to build a road from a point on the north bank of the Boise River about two miles above Boise City, in Ada County, through Boise City and down Boise Valley to the Snake River, near the mouth of Boise River, to form a junction with the Oregon Pacific. The capital stock is \$300,000.

Boston & Maine.—The citizens of Norton Mills, Vt., have asked this company to build an extension from Stanstead Junction, Que., southeast to Norton Mills, on the Grand Trunk, a distance of about 16 miles.

Brierfield, Blockton & Birmingham.—The contract for building the section from Gurney north to Bessemer, Ala., where connection is made with the Georgia Pacific, has been let to Aldrich, Worthington & Co., of Birmingham, Ala., who also built the division between Montevallo and Blockton.

Central of Georgia.—All the tracklaying has been completed on the extension of the Savannah & Western from near Eden, Ga., to near Stirling, with the exception of about 12 miles. Cunningham & Fitzpatrick are doing the tracklaying on the western section, and the company's force is doing the work on the eastern section. The line was first known as the Savannah & Americus branch, and it was located from Eden to Americus, Ga. An agreement was then made with the Savannah, Americus & Montgomery by which that company was to build a line from Americus east to near Stirling, near the Montgomery and Tattnall county line, where it was to be joined by the branch of the Central of Georgia. The line between Americus and Stirling has been completed, and this road has accordingly been built from a point on its main stem, called Savannah and Western Junction, about 17 miles from Savannah and near Eden station, due west to the connection with the Savannah, Americus & Montgomery at Lyons Station, a distance of 57½ miles. The grading has been completed on nearly the entire line. The maximum grade is one per cent. on straight line

and equated for curves, which do not exceed six degrees. There are three 50-ft. iron plate girder bridges, over Pendleton's Creek and the Ohoopie and Canouchee rivers. Wright & Strother and J. T. Millen are the contractors for grading, but their work is practically finished. J. W. Adams and C. K. Leitner are contractors for trestle bridging, and Phillips & Turner are contractors for cross-ties.

The company has made agreements with the minority stockholders of the Port Royal & Augusta and Savannah, Griffin & North Alabama roads by which their suits as stockholders of the latter two roads against the company, are to be abandoned. Motions have been filed in the United States District Court in Georgia to have the suits dismissed. The Central of Georgia owns a controlling interest in both lines, but their reorganization by that company and consolidation with the other lines of the system have been retarded by the suits brought by the minority stockholders of the roads.

Chattanooga Southern.—Ground was broken at Gadsden, Ala., last week, and work is to be continued north to meet the line being built south from Chattanooga. About 20 miles have been completed on the Chattanooga end, and about 7 miles are in operation. The survey has not been finished on the section, but a party of engineers are now engaged in this work. E. F. Whitman is Chief Engineer.

Chesapeake & Ohio.—The preliminary survey has been completed for the proposed branch from near Clifton Forge, Va., north to Warm Springs and Hot Springs, in Bath County, a distance of about 25 miles.

Chicago, Fort Madison & Des Moines.—The purchasers of the Fort Madison & Northwestern have incorporated this road, and will operate the line under the above name. They confirm the report that it will be widened to standard gauge and extended to Ottumwa, Ia. The capital stock of the company is \$2,500,000.

Chicago, Rock Island & Pacific.—The extension of the Southwestern division of the Chicago, Kansas & Nebraska, from Pond Creek, has now been completed to Queen City, I. T., about 15 miles south of Fort Reno. Work is in progress from Queen City toward Henrietta, Tex., near the Red River, which will probably be the first town in Texas which the road will reach.

Cincinnati & Richmond.—The Richmond & Miami, Cincinnati, Richmond & Chicago and Cincinnati & Richmond were consolidated last week under this name. The roads are all operated by the Pennsylvania Co., which owns nearly the entire capital stock of the companies.

Corsicana & Southeastern.—The subscriptions to the capital stock of this company amount to \$200,000 in Corsicana, Tex. The road is to extend from Corsicana southeast through Fairfield to a connection with the International & Great Northern. The distance is about 45 miles.

Danville & East Tennessee.—The engineers who were running the preliminary survey of this extension of the Atlantic & Danville from Danville, Va., west to Bristol, Tenn., were recalled last week. It is stated that an agreement has been made with the Danville & New River road by which that line will be used as the western extension of the Atlantic & Danville. It extends from Danville west to Stuart, Va., 75 miles.

Decatur & Bridgeport.—The survey is now being made from Decatur, on the Fort Worth & Denver City, west to Bridgeport, Wise County, Tex., a distance of about 11 miles. The survey will be completed in about two weeks, when it is expected the grading will be commenced. The road will reach large coal fields at Bridgeport. Col. J. J. Lang, of Decatur, is President.

Denver, Colorado & Pacific.—Chief Engineer Robert B. Stanton reached the Needles, Cal., last week, after passing through the Grand Cañon of the Colorado River from Grand Junction, Col. He has returned to Denver for a short rest, when he will resume the journey through the cañon of the Colorado River from the Needles to the Gulf of California. Mr. Stanton believes that the construction of a road through the cañon is perfectly feasible, and that from Grand Junction, Col., to the Needles, a distance of 900 miles, the grade need not at any place exceed 20 ft. per mile, and for the greater part of the distance would not be more than 5 to 10 ft. per mile, while curvature, contrary to general expectation, he believes will be slight. The results were much better than he anticipated. Mr. Stanton has gathered considerable data upon the resources of the country adjacent to the cañon. Between the head of the Colorado River and the end of the Grand Cañon, he passed over 530 rapids. During his passage over Rapid No. 465, below Peach Springs, one of his boats was damaged by a collision with the rocks, and he was washed overboard by a wave, thrown into a whirlpool, and drawn downward into the river. He finally came to the surface 50 ft. from where he went down, and was rescued.

East Tennessee, Virginia & Georgia.—It is stated that the company is to build a new brick station in Rome, Ga., and that its location is such that it will be necessary to build a branch from Printup, a small town near Rome, along the eastern bank of the Oostanaula River, to Broad street, in Rome.

Florence Northern.—The locating survey was completed to Linden, Tenn., last week, by C. O. Baker, Assistant Engineer. The distance is 76 miles, and of this the first 25 miles from Florence were graded last fall.

Fort Worth Belt.—A company of this name was chartered in Texas last week to build a belt road encircling the City of Fort Worth, Tex., the capital stock being \$500,000. The Fort Worth & Albuquerque has completed the grading on a belt road at Fort Worth for nearly three-quarters of the distance. The new company is a separate organization, and it is not believed that it will do any construction work.

Franklin & Tilton.—The route of this road has been fixed by the New Hampshire State Railroad Commissioners. The line will leave the Northern road about a mile below Franklin, N. H., cross the Merrimack River and extend thence through the land of several property owners, whose buildings in many cases will have to be removed. It will cross the Pemigewasset River twice and will continue on the east side of that stream to Tilton, on the Concord & Montreal, about four miles. Grade crossings will be avoided as much as possible.

Grand Rapids, Chicago & St. Louis.—The Grand Rapids & Lake Michigan was reorganized under the above name at a meeting held in Holland, Mich., March 23. The road is to extend from Grand Rapids to St. Joseph, Mich.

Gulf, Brazos Valley & Pacific.—A small force is grading the section between Mineral Wells and Millsap, Tex., 19 miles. When the grading has been finished between these points work will be commenced on the section from Mineral Wells north to Henrietta.

Gulf, Shreveport & Kansas City.—The election in Shreveport, La., March 22, to vote on a five-mill tax in favor of this road, was carried nearly unanimously.

Harrisburg & Potomac.—The road is to be sold July 2 by the trustees of the first mortgage, the Provident Life & Trust Co. of Philadelphia. No interest has been paid for a number of years on the seven per cent. bonds, which amount to \$507,200. The stock and bonds are nearly all owned by the Philadelphia & Reading, and that company will buy in the road and extend it. It extends at present from Bownansdale to Shippensburg, Pa., 32 miles.

Kanawha & Ohio.—This road, at present in the hands of a receiver, has been leased to the Chesapeake & Ohio, which will begin to operate the line on the completion of the reorganization of the company. It will guarantee under the lease the interest on the new four per cent. bonds, and it also agrees to care for the leased property and to pay over the first two per cent. after fixed charges have been met. Whatever sum may be earned in excess of these amounts is to be equally divided between the two companies. The road extends from Charleston, W. Va., to Corning, O., a distance of 123 miles.

Kansas City, Nevada & Fort Smith.—The locating survey for the section between Nevada and Monett, Mo., was completed last week. The company has received many bids from contractors for building the section, and it will probably soon award the contract. Richard Gentry, of Kansas City, is General Manager.

Kansas City, Wyandotte & Northwestern.—Judge Caldwell, of the United States Circuit Court for Kansas, has appointed Newman Erb Receiver of this road and of the Kansas City & Beatrice, in the suit brought by the Farmers Loan & Trust Co., of New York, to foreclose the first mortgage. The court required that the debts and liabilities of the company incurred in the construction and operation of the road, including damages to property since the execution of the mortgage, should be made prior to the first mortgage bonds. Kilpatrick & Co., of Beatrice, Neb., have filed a lien for \$27,385 against the Kansas City & Beatrice, for constructing the road, and the Kansas City, Fort Scott & Memphis has filed a lien for \$30,000 against the same road for material furnished.

Kentucky Union.—The tracklaying has been completed to within six miles of Lexington, Ky., from Winchester, and it is expected to have the section finished this week. Trains will then be run between Lexington and the Kentucky River.

Knox & Lambton.—A bill is before the Canadian Parliament to incorporate this company, to extend from Chatham to Sarnia, Ont., parallel to, and 12 miles shorter than, the Erie & Huron, between these points. Connection will be made with the Michigan Central at Petrolia.

Lackawanna & Southwestern.—This company has become the owner of the Lackawanna & Pittsburgh and of the Rochester, Hornellsville & Lackawanna, and will operate them under the above name after April 1. The Central Construction Co., which has been engaged in the reconstruction of the properties and in the temporary operation of them, on that date ceased such operation and surrendered control. The narrow gauge division of the road will be changed to standard gauge.

Lampasas, Burnet & Southwestern.—Interest in this proposed road has been renewed, and steps have been taken to begin the grading soon. It is stated that the bonds have been placed. The road was at first proposed to extend from Lampasas to Burnet, on the Austin & Northwestern, 23 miles, but the charter of the company has recently been amended so that the line can be built to Llano, about 30 miles from Lampasas, and it may be decided to make this the southern terminal point instead of Burnet.

Louisville & Nashville.—Major R. E. O'Brien and Frank C. Gracey, assistant engineers, have been engaged for the last few weeks in securing the right of way and finishing the location for the proposed branch from Clarksville to Dickson, Tenn., a distance of 35 miles. The grading will probably begin as soon as they finish this work.

Louisville, New Albany & Chicago.—The Executive Committee has recommended that a new general five per cent. mortgage be issued to the amount of \$12,000,000, at the rate of \$25,000 per mile. The mortgage is to take up the present floating debt, refund the present bonds and provide for various improvements.

The trains of the road now enter Louisville over the Louisville Bridge Co.'s bridge, instead of over the bridge of the Kentucky & Indiana Bridge Co. The latter was used under the old management, and it has a contract with the road and will begin suit to enforce it. The Louisville Union station is still used, but the Jeffersonville, Madison & Indianapolis station will probably soon be.

Louisville Southern.—The company took possession of its road March 27, and now operates independently of the Louisville, New Albany & Chicago, to which it was leased in December, 1888. The lease was for 30 years, and the lessee agreed to pay a rental equal to the interest on the first mortgage bonds, surplus earnings to be divided equally between the two roads. The new directors of the Louisville, New Albany & Chicago had decided to abandon the lease of the branches of the Louisville Southern, and operate only the main line between Louisville and Burgin, Ky., 82 miles. Agreements for the interchange of traffic were also made with the Louisville & Nashville, of which this road is a close competitor. The directors then decided to regain possession of the road. This they did, also securing an injunction to prevent the Louisville, New Albany & Chicago from interfering in the operation of the road.

Mexican Central.—The Tampico branch was completed last week between San Luis Potosi and Tampico, Mexico. The contract for improving and deepening the harbor at Tampico has been let to the New Orleans Jetty Co., and that work was begun this week.

Mexican Roads.—Augustin Soza has secured a concession from the Mexican Government for the construction of a road from Ometusco to Tulacingo, through a rich part of the state of Hidalgo.

Michoacan & Pacific.—This road is now completed between Maravatio, on the Mexican National, to Trojes and Anganguo, 35 miles. The preliminary surveys have been made to Zitacuaro. This line is projected to a junction

with the Inter-oceanic, of Mexico, at or near Amacuasac. About 500 men are now working on the line, but this force will be largely increased as soon as the permanent survey has been completed to Zitacuaro. J. H. Hampson, of Kansas City, is the contractor for the grading and track-laying. The road is narrow gauge, and has maximum grades of 2.90 per cent. and maximum curves of eight degrees. The locomotives have been built by the Baldwin Locomotive Works, and the cars chiefly by the St. Charles Car Co. The road is being built by the Michoacan Railway & Mining Co., and the funds have been secured in Europe. G. C. Baird, of Las Trojes, Anganguero, is General Manager.

Middle Georgia & Atlantic.—An agreement has been made by which an extension is to be built from Machen, on the Covington & Macon, west to Covington, a distance of about 20 miles. It is stated that work will begin before April 20. The section from Machen east to Eatonton, 15 miles, will probably be put in operation this month.

Millan & Southern.—Chartered in Georgia to build a road about 50 miles long from Millan, on the Central of Georgia, to Sterling, in Montgomery County, passing through Screven, Burke, Emanuel, Tatnall and Montgomery counties. The capital stock is \$120,000. W. B. Stillwell, of Savannah, is an incorporator.

Monterey & Mexican Gulf.—The extension from Monterey northwest to Trevino, on the Mexican International, 100 miles, was finally finished March 31. The road is standard gauge, and the extension to Trevino on the Mexican International, gives it a connection with a standard gauge road, extending to the United States boundary.

New Roads.—A meeting was recently held in Fredericksburg, Va., to arrange for the construction of a road recently chartered by the Virginia legislature, and which is to extend from Fredericksburg, through the counties of Stafford, King George, Westmoreland, Northumberland, Richmond and Lancaster, to a point at or near the mouth of the Rappahannock River. J. E. R. Crabbe is one of the projectors.

A road is proposed from Yatesville, Ga., to Barnesville, Ga.

A company is being organized in Altoona, Pa., to build a narrow-gauge road from that city to a point two miles beyond Wopsononock in the Allegheny Mountains. The line will be seven miles long. It will develop a rich coal, stone, and lumber region.

A project for a narrow-gauge line from Auburn to Livermore, Me., is being discussed.

At a meeting held in Cadiz, O., recently, a committee was appointed to obtain right of way for a proposed road from Bellaire, on the Ohio river, northwest to Valley Junction, on the Valley road, which is now controlled by the Baltimore & Ohio. Connection will also be made with the latter road at Bellaire. The distance is about 67 miles.

John Gilman's scheme of building a railroad from Spencer, Mass., to Hartford, Conn., and its possible extension in other directions, was discussed in a meeting at Worcester, Mass., on Tuesday, last. Mr. Gilman himself was the principal speaker. Others were Stephen Salisbury, of Worcester, and Mayor Fitch, of Rockville, Conn.

New York, Lake Erie & Western.—The earnings of the road for February and the five months to Feb. 28 were as follows:

Month of February.	1890.	1889.	Inc.
Gross earnings.....	\$2,056,486	\$1,711,177	\$345,309
Oper. expenses.....	1,348,402	1,128,701	219,701
Less proportions due leased lines.....	\$707,994	\$582,476	\$125,518
Net earnings.....	200,892	159,681	41,210
Five Months, Oct. 1 to Feb. 28.			
Gross earnings.....	\$507,192	\$422,705	\$84,487
Oper. expenses.....	1890. 1889.		
Gross earnings.....	\$11,681,306	\$10,599,885	\$1,081,421
Oper. expenses.....	7,728,402	6,968,110	760,292
Less proportions due leased lines.....	\$955,904	\$3,631,775	\$324,129
Net earnings.....	\$1,085,833	\$945,721	140,112
Net earnings.....	\$2,870,071	\$2,686,054	\$184,017

Norfolk & Carolina.—The road was opened last week for passenger traffic the entire distance between Norfolk and Tarborough, N. C., on the Wilmington & Weldon, a distance of 100 miles. Freight trains have been running for some time, a transfer being made at the Roanoke River. The iron bridge over the river is now completed.

Norfolk & Western.—The following is the statement of earnings and expenses for February, and the two months to Feb. 28:

Month of February:	1890.	1889.	Inc. or Dec.
Passenger, mail and exp....	\$82,181	\$68,592	I. \$13,589
Freight.....	356,113	334,427	I. 21,686
Gross earnings.....	438,294	403,019	I. 35,275
Oper. expenses and taxes.....	312,360	269,153	I. 43,207
Net earnings.....	\$125,934	\$133,866	D. \$7,932
P. c. of expen. to gross earn....	71	67	
Two months to Feb. 28:			
Passenger, mail and express....	\$175,681	\$148,278	\$27,403
Freight.....	779,700	652,806	126,894
Gross earnings.....	955,380	801,084	154,296
Oper. expenses and taxes.....	636,978	556,519	80,459
Net earnings.....	\$318,402	\$244,565	\$73,837
P. c. of expen. to gross earn....	67	69	

The tracklaying on the Clinch Valley Division has been completed to a point called Breedman Ford, on Clinch River, 45 miles west of Tazewell Court House. It is expected to complete the division this month to Minneapolis, Russell Co., Va., to which point the Charleston, Cincinnati & Chicago is also building.

It is stated that the company will build a belt line at Roanoke, Va., from the Roanoke Iron Co.'s furnace, in the western part of the city, down the Roanoke River to the two iron bridges to be built by the Roanoke Gas & Water Co.

Northern Pacific.—The Board of Trade of Lewiston, Idaho, have raised a subsidy of \$100,000 for an extension of the Spokane & Palouse division of this road south to Lewiston, near the Washington state line.

Northwestern Monroe.—This road is at present about three miles long and extends from Lucas, O., on the Pittsburgh, Fort Wayne & Chicago, to the stone quarries of the Baker Stone Co. It is proposed to extend it northwesterly from its present terminus to Mansfield, about five miles. Charles W. French, of Mansfield, is Vice-President and General Manager.

Oakland & State Line.—This road, which is now part of the Confluence and State Line, was sold last

week at Oakland, Md., under a mortgage sale, for \$100,000. The purchasers were Cowan & Cross, of Baltimore. The road extends from Confluence, on the Pittsburgh & Connellsville, up the Youghiogheny River to Friendsville, in Garrett County, a distance of 17 miles. It is stated that the extension from Friendsville to Oakland will soon be commenced.

Pacific, Denver & Gulf.—Articles of incorporation have been filed at Santa Fe, N. M., by this company, which is to operate the various lines owned by the Union Pacific and Denver, Texas & Fort Worth, in New Mexico, Texas, Wyoming and Colorado, and also to build several extensions, including the line from Maxwell to Las Vegas, N. M., and to the Taos Mountains.

Paducah, Nashville & Charleston.—The Kentucky Legislature has granted a charter to this company, previously referred to. The road is to be an extension of the Ohio Valley from Princeton, Ky., the present terminus, to Nashville, Tenn., about 80 miles. The extension is chartered in Tennessee as the Nashville Northern, and about \$100,000 has been subscribed in Nashville to the capital stock of that road.

Pecos Valley.—The company expects to let contracts for building the greater part of the line by May 15. The road is to extend from a point on the Texas & Pacific in Ward County, Tex., north, up the Pecos River to Eddy, and thence to Roswell, N. M., a total distance of 185 miles. The road in New Mexico is chartered as the Pecos Valley, and in Texas as the Pecos River. The surveys have been nearly completed. J. J. Hagerman, of Colorado Springs, Colo., is President of the first company, and Charles B. Eddy, of Eddy, N. M., is President of the latter company.

Quebec & Lake St. John.—It is expected to have the extension easterly from Chambord Junction on Lake St. John to Chicoutimi and to St. Alphonse, Que., the head of deep water navigation on the Saguenay River, opened in time for the tourist travel. The distance is about 70 miles and the contract has been let to H. J. Beemer, of Montreal. This line will develop a rich agricultural district, with a population of about 40,000, and will also make easily accessible an attractive tourist region.

Redondo.—The company will begin operating the road between Redondo and Los Angeles, Cal., 17 miles, on April 15. George Tod, Jr., is Superintendent.

Rio Grande Southern.—The grading was commenced last week at both Dallas and Rico, Colo., by a force of nearly 800 men. It is expected to have fully 1,500 men at work on the 45 miles between these points in a short time. Carlisle & Co., of Pueblo, are the contractors.

St. Clair, Madison & St. Louis.—The company has filed articles of incorporation in Illinois, to construct a road from a point near the city of Belleville, in St. Clair county, to a point on the Mississippi River, at or near Alton, and to a point on the boundary line between the states of Illinois and Missouri, and thence to the city of St. Louis. The principal office is to be at East St. Louis. The capital stock is placed at \$300,000.

St. Louis & Chicago.—The report of Master Commissioner Bluford Wilson in the consolidated case of the American Loan & Trust Co. against the St. Louis & Chicago, the Mount Olive Coal Co., etc., has been filed in the United States Circuit Court at Springfield, Ill. The report is voluminous, and gives a history of the issuance of the first mortgage consolidated bonds. On April 1, 1887, \$4,500,000 were issued and secured by a mortgage to the American Loan & Trust Co. The introduction of F. C. Hollins, of New York, as one of the directors, and of Frank C. Hollins & Co., as fiscal agents, is explained. The report says that they raised the bonded indebtedness of the consolidated company from \$1,250,000 to \$1,650,000. In this arises what the report finds to be an over issue of \$400,000. The purchase of a number of bonds by Hollins, and their sale by him at a large profit, is referred to. The report concludes: "I find that neither Wing nor Hollins has, in equity, the slightest claim either upon bonds 1,401 to 1,600, inclusive, or to those of any issue herein mentioned, or to any such bonds held by others for them. Both have been largely overpaid for any services, advances or property contributed by them, and should be compelled by the court to account with its receiver or master."

Salisbury & Harvey.—The Albert road of New Brunswick is now operated under this title. The road extends from Salisbury on the Intercolonial to Harvey, 48 miles.

San Antonio & Aransas Pass.—The company has been asked to build a road between Corpus Christi and Aransas Pass, Tex., along the shore of Corpus Christi Bay and across Mustang Island. The distance is about 38 miles.

San Francisco & North Pacific.—As it is probable that this road must be sold in order to carry out the bequests made in the will of the late Col. J. M. Donahue, who was President, and who owned nearly the entire capital stock, it was believed that the uncompleted improvements would be discontinued. The directors, however, have decided on the following work: The building of extensions from Ukiah northward to Capella, Cal.; the changing of narrow to standard gauge; the extension of the Guerneville branch road further into the redwoods; the substitution of steel rails for iron; the purchase of additional rolling stock.

Southern Pacific.—The grading will soon begin on an extension of the Stockton and Copperopolis division, from its present terminus at Oakdale, south to Merced, Cal., on the main line of the Southern Pacific. The extension will be about 40 miles long. The locating survey has been made and the right of way secured. About 400 men will be employed on the line.

Tavares, Apopka & Gulf.—At the foreclosure sale held in St. Augustine, Fla., March 29, the road was purchased by H. H. Jackson and others, of New York City. The road had been previously sold to the same parties last January to satisfy a judgment obtained by the Central Trust Co. of New York. The road extends from Tavares to Clarmont, Fla., 29 miles.

Topeka, Westmoreland & Marysville.—The contract for building the first 55 miles has been awarded, and sub-contracts will soon be let. The locating survey commenced at Topeka last week. Much of the right of way has already been secured. The office of the company is in North Topeka, Kan.

Union Pacific.—The section of the Colorado Central between Fort Collins and Colorado Central Junction, near Cheyenne, about 40 miles in length, which was

abandoned some years ago, is to be rebuilt, and will probably be in operation by June 1.

The company is laying 75-lb. rails on the Boulder division of the Colorado line. The tracklaying will commence next week on 13 miles, between Argo Junction and Burns Junction, Colo.

Ground has been broken on the extension of this road from Wendover north to the connection with the Fremont, Elkhorn & Missouri Valley road.

Union Point & White Plains.—The reconnaissance for the extension from White Plains through Sparta to Tenille, Ga., about 34 miles, was completed last week. The counties of Hancock and Washington will be asked to subscribe bonds to aid in building the line.

Vancouver, Klickitat & Yakima.—Construction work is to be commenced on the third five-mile section of this road east of Vancouver, Wash., in a few weeks. The road is now completed for ten miles from Vancouver.

Virginia Roads.—The following companies have been incorporated in Virginia by the state legislature: Georgetown & Falls Church; Caroline; Portsmouth & Smithfield; Metropolitan Western; Washington & Mount Vernon; Salem Hunt, and Potomac & Piedmont.

Washington & Elberton.—T. B. Green, F. H. Colley, and M. P. Reese have been appointed a committee to interest the Richmond & Danville, or the Georgia, Carolina & Northern, in building this road between Washington and Elberton, Ga., and arrange, if possible, to have one of the roads construct it.

Washington Southern.—The Alexandria & Washington and the Alexandria & Fredericksburg, which are operated by the Baltimore & Potomac, have been consolidated under the above name. The roads extend from a connection with the Baltimore & Potomac, near Alexandria, south to Quantico, Va., about 45 miles, where they connect with the Richmond, Fredericksburg & Potomac.

West Virginia Central.—It is stated that an English syndicate has undertaken the construction of this road through West Virginia. The road has recently secured an amended charter, and the route was given in our issue of March 7. The original charter was granted in 1883, when surveys were made and some right of way was secured. About 20 miles of road was graded when work was abandoned.

Wilmington, Onslow & East Carolina.—The surfacing on the section between Wilmington and Jacksonville, Onslow County, N. C., 50 miles, has been nearly finished. The grading has been done for some time, and several miles of track have been laid from Wilmington, and a junction has been made in that city with the tracks of the Wilmington Sea Coast. George N. Brockman is engineer.

Wilmington & Weldon.—The company has under consideration an extension of the Scotland Neck branch from a point near Greenville east about 20 miles, to Washington, N. C., the southern terminus of the Jamesville & Washington. The construction of the line is dependent upon the acceptance of a proposition made by the company to the town of Washington. It is stated that an extension may also be built from Greenville west to Wilson, on the main line, about 20 miles.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, April 2, 1890.

The week has been eventful only for the absence of any new developments in the traffic situation. As I predicted in my dispatch last week, the meeting of the Passenger representatives adjourned without concluding their work of forming a new association to take the place of the defunct Western States Passenger Association, and final action is postponed, awaiting the action of the presidents, who are in session to-day.

There is considerable speculation as to who will be Chairman of the Passenger Association when reorganized. There was much difference of opinion when the subject was up before the disbandment of the Western States Association. E. P. Wilson, now General Passenger Agent of the Northwestern, has a considerable following and has had experience in association work. W. F. White, the present Passenger Traffic Manager of the Santa Fe, also has considerable following and would make a good chairman, but it is doubtful whether he would care to leave his present position to accept it; certainly the Santa Fe could ill afford to lose him.

"THE WESTERN ASSOCIATED RAILWAYS."

The presidents, vice-presidents and general managers of lines, members of existing associations west, north-west and southwest of Chicago, met this morning in response to the call to hear the report of the committee on organization of a new association to embrace the whole territory. Among those present were Messrs. Goddard, W. F. White, McMullen, Chappell, Stone, Ripley, G. B. Harris, Hamlin, Huggitt, Tucker, St. John, Egan, Winter, Hooper, Merrill, Fish, Treadwell, Howe and Hays. The important lines unrepresented were the Union Pacific, Missouri Pacific, St. Louis & San Francisco, Rio Grande Western, Kansas City, Fort Scott & Memphis and Wisconsin Central. All these except the Wisconsin Central and the Rio Grande Western sent excuses for their non-representation.

Vice-President Jas. F. How, of the Wabash, was chosen chairman of the meeting. The majority report, by Chairman Walker, Faithorn and Finley was read by Mr. Walker, and was substantially as follows:

It seems clear to the committee that the "more general co-operation" desired could not be obtained in an organization which should impose restrictions and obligations beyond the limits which had been fixed by some of the lines whose affirmative support was desired. The idea of adopting measures tending to greater centralization of authority was therefore necessarily discarded. In taking this course the members of the committee do not surrender their personal opinions as to what would be theoretically the most desirable arrangement for all the lines. We are aware that this course is liable to cause some disappointment. Much may be said, for example, in favor of a final arbitration tribunal, empowered to pass upon all matters of difference between members, and able ultimately to control the fixing of competitive rates. Nevertheless, it seems impracticable at the present time to bring about a general arrangement of this kind among the Western roads. Arbitration which a party is at liberty to disregard at pleasure is not arbitration at all. The committee therefore perceive no alternative but to preserve to each line the right of independent action in the establishment of freight rates in substantially the manner heretofore in vogue. In respect to territory, the agreement is so framed

that it may embrace all lines west of the Central Traffic Association from Canada to the Gulf. In important cases a meeting of Vice-Presidents and General Managers of interested lines may be called, whose action, if unanimous, is to be authoritative. It is provided that this meeting may not initiate reductions, and it is believed that in cases of strife or of error the opportunity afforded for their interference will be found of great use. The question of how rates and rules, when established, shall be maintained, is the most serious one. It is, unfortunately, true, that the requirements of law, even though attended with severe penalties, are not in all cases sufficient to secure the prevention of individual discrimination. Experience has also shown that extra-judicial penalties imposed under association agreements do not accomplish the desired result. The committee, therefore, have decided to omit the entire idea of enforcing rules by the imposition of penalties, and to recommend leaving the whole responsibility for the maintenance of rates with the President or other chief executive officer of the respective lines. The tendency of the railroad system of the country has always been, and still is, in the direction of consolidation of lines and concentration of control. The provisions of the act to regulate commerce add much strength to this natural movement. It is believed to be a proper and legitimate tendency. It tends to economy and efficiency of service, and promotes the interest both of carriers and of their patrons. Leases, purchases and consolidations have been customarily regarded as legitimate even among associated lines. Traffic contracts to the same end present aspects in some respects similar. The announcement of the position that, for the present at least, no obstacles will be thrown in the way of agreements of this kind can hardly fail to operate favorably upon the railroad system as a whole. A recommendation is made which is intended to prevent the obtaining of undue advantages through the initiation of new alliances, by requiring that such contracts shall be reported for publication to all lines at least 30 days before they are to become effective. Subject to that restriction, and to the requirement that rates and divisions shall be made pursuant to the agreement, the committee suggest leaving so-called traffic contracts without other regulation.

The committee say they recognize the necessity for some system "under which lines disadvantageously situated may be assured some participation in the traffic for which they were constructed," but do not consider it practicable "in the organization of an association of this kind to lay down any general plan for adoption everywhere, nor would it be thought expedient to intrust a central board with the power necessary to make and execute the various arrangements that would be required. Their formation is properly a matter of negotiation between the lines interested at any given point, or in any given traffic."

Chairman Midgley read a minority report in which he stated that he agreed in the main with the majority, but recommended the separate establishment of the Southwestern, Western and Trans-Missouri Associations substantially as described by the majority report, and that for matters of greater concern committees of conference be established. He continues: Beyond the machinery thus outlined I do not think it advisable at this time to go. The creation of a board of arbitration cannot consistently be undertaken. Such a board, during the past year, has been in effect little more than advisory. No contract, however wisely drawn, will be likely to prove effectual unless it contains an explicit agreement to divide the competitive traffic. The right of every road reaching a given point to participate in the business to and from that point should be conceded. The machinery by which a division of traffic could be brought about need not here be pointed out. Suffice it to say that one method is well known and has not been questioned. If a division of traffic should thus be in sincerity undertaken, the chief incentive to secure business would be removed.

The proposed agreement was then read in full. It is entitled, "Articles of agreement of the Western Associated Railways." Article 1 recites that the agreement is a reconstruction of existing agreements, and that other lines are given opportunity to unite. Article 4 establishes four territorial freight associations, Southwestern, Western, and Northwestern and Trans-Missouri, acting monthly upon notices given of proposed changes, with a Commissioner for each. Article 5 relates to their organization and government. A two-thirds vote gives effect to propositions under consideration, but lines may assume the responsibility of putting in rates not receiving a two-thirds vote, if notice is given at the same meeting. Outside competition may be met by any line at its peril. If the Commissioner "afterward decides adversely, the rate must be immediately withdrawn. Any reduction in rates, change in divisions, agreement with shippers contrary to agreement, willful underbidding in weight, or billing at wrong classification, are violations of agreement. Article 6 provides for joint meetings in proper cases, the intention being that each line shall have a permanent representative in each association in which it operates, who shall be, first and last, the party responsible for its rates. Article 7 establishes the Western Passenger Association with a Commissioner and an Assistant Commissioner and five territorial committees. The rules are substantially the same as those of the late Western States Passenger Association. Article 8 relates to organization of the "Western Associated Railways," for the maintenance and enforcement of the rates, rules and regulations established by the Freight and Passenger Associations. Representation is to be by the President.

An Executive Committee is established, consisting of a chairman and the Commissioners of the Freight and Passenger Associations. Their duties are the determination of all questions of alleged violation of agreement or of the Interstate Commerce Law. Section 3 provides that when complaints are made to the Committee or any Commissioner that the Interstate Law or the Association agreement has been violated, a statement of the case shall be transmitted to the party complained against, who is to have ten days from receipt to reply. The matter is then to be investigated by the Executive Committee. If a majority sustain the charges, a copy of their conclusions is to be furnished the President of each line, and the President of the line at fault shall communicate to the committee within ten days a statement of his action. In cases of disagreement parties may agree upon arbitration by the committee, or by a special board. A majority decision is to be final, subject to the right of any member to reopen the question by a new notice after 90 days. Section 8 provides that any two or more companies may agree upon measures for securing to each its due share of competitive traffic. Section 9 provides for traffic contracts, but they must be reported to the Executive Committee at least 30 days be-

fore becoming effective. Article 9 lays down the principles of organization in conformity with rules and regulations and existing legislation.

The general expression of opinion among those at the meeting was in favor of completing an organization upon the general plan submitted, incorporating more distinctly the feature of division of traffic. The meeting referred the whole matter to a committee of one from each line represented. The committee is to procure the representation on the committee of absent lines as far as possible, and to report as soon as practicable. The meeting adjourned subject to the call of the chair to hear this report. It was also voted that the new passenger agreement now under consideration be completed without reference to any action of this meeting. The committee was to meet Thursday morning, with General Manager Chappell, of the Chicago & Alton, as chairman. The meeting was very harmonious. The 19th meeting of the Board of Managers of the Interstate Commerce Railway Association is called for April 9.

Traffic Notes.

The Transcontinental Association has reduced rates on oranges and lemons from California to Chicago from \$1.25 to \$1.10 per 100 lbs.

The discontinuance of reduced rate round-trip tickets on some Michigan roads, in consequence of the passage of the law limiting fares, has resulted in a large increase of cash fare collections.

The roads centering in Pittsburgh, Pa., which have charged demurrage more or less regularly for many months, have now formed the Pittsburgh Car Service Association, which went into effect March 31.

At Kansas City, on Monday, all the roads announced a rate of \$5 to St. Louis and Chicago, a reduction of \$2 and \$3 from the regular rate. The ticket brokers go even lower, and tickets over all the lines, the Burlington excepted, could be bought from them for \$4.50 and in some cases \$4.

A shipper of grain at Beloit, Ia., appealed to the Railroad Commissioners of that state to compel the Chicago, Milwaukee & St. Paul to apply state rates on shipments from that town to Sioux City; but the road between the two places runs for a portion of the distance in Dakota, and though the commissioners have issued the desired order, the road refuses to comply. Suit will probably be brought to compel compliance.

Commissioner A. J. Vanlandingham, of the Kansas City Transportation Bureau, has prepared a table giving comparative prices on grain since Jan. 20, together with freight during the intervening period. He presents figures to show that the emergency rates, contrary to expectation, have been of value to the farmer since the middle of February, when the slight drop in the price of corn was restored, while the freight rates remained low.

The Atchison, Topeka & Santa Fe has withdrawn the half rate on wheat from Kansas points to flouring mills which has been in force for a few months. The rate applied only when 75 per cent. of the tonnage was forwarded by the same lines from the mills in the form of the manufactured product. This rule has worked to the disadvantage of the lines terminating at the Missouri River, from both the east and west, and they have vigorously protested against it. It is said that the Chicago, Rock Island & Pacific, Atchison, Topeka & Santa Fe and Missouri Pacific have been enabled to handle nearly all of the business of Kansas millers to the exclusion of their competitors.

Consignees' Views of Demurrage Traffic.

The Northwestern Lumberman notes that at a meeting of lumber dealers in Chicago two years ago there was great excitement and outcry concerning demurrage; and that at a similar meeting recently every one was as quiet as a lamb on the subject. "A Twenty-second street operator said the demurrage system had given a new activity to his men. That now when the switch engine left a loaded car in his yard, there was an extra effort made to rid it of its load, and that in consequence he had to pay no demurrage, and besides got more satisfactory work from his men. It was agreed that, all in all, the Car Service Association had, by adhering to its mapped-out policy, really benefited the entire wholesale hardwood trade."

St. Louis Weighing and Inspection Bureau.

The annual report of E. W. Braisted, chairman of the St. Louis Bureau for the Weighing and Inspection of Freight, has been issued, and shows the total number of cars weighed at the Union Depot and St. Louis during 1889 to have been 30,599, an increase of 2,794 cars over 1888. The total weights, as furnished by shippers, were 481,766 tons; the actual weight aggregated 501,696 tons, an increase of about four per cent.

Amount of excess revenue earned by car-load weighing.....	\$19,930
Amount of excess revenue earned by inspecting and weighing platform freight.....	32,681
Total.....	\$52,611
Less expense of weighing and inspection.....	7,009
Net gain 1889.....	\$45,602
Net gain 1888.....	31,004
Increase.....	\$14,598

Virginia Freight Traffic Association.

At a meeting of the traffic officers of the Virginia railroads, held at Richmond March 27, an association was formed to be known as the Virginia Freight Traffic Association. The object of this organization is to secure harmony of action in the establishment of classification and rates on freight traffic, and uniformity in bills of lading receipts and business relations with patrons. The following officers were elected: President, E. D. Hotchkiss, Chesapeake & Ohio; Vice-President, J. H. Drake, Richmond & Danville, and Secretary, Howard Neagle, Chesapeake & Ohio.

Chicago Car Service Association.

Chairman E. D. Moore, of the Chicago Car Service Association, has issued his report for the year 1889. This report shows that 806,023 track cars were handled by the associated roads, with an average detention of 1.70 days. The lowest number of track cars handled in one month was 51,071 and the highest 91,932; as compared with the record of 1889, the report shows a saving to the roads of more than five days on the 806,023 cars handled. The road reporting the greatest number of cars was the Burlington, with 105,000, while the smallest number, 4,518, was reported by the Chicago & Grand Trunk.

A comparison for the months of December, 1888 and 1889, shows that in December, 1888, there were handled 69,010 cars, with an average daily detention of 2.37 days; in December, 1889, 77,941 cars, with an average daily detention of 1.52 days. A comparison of the months of December in 1887, 1888 and 1889 (the association began in November, 1888), shows the average daily detention of

track cars on five roads as follows: December, 1887, 7.87 days; December, 1888, 2.49 days; December, 1889, 1.76 days. The five roads taken are representative roads and probably represent correctly the general average. Figures for other roads for 1887 were not obtainable. The rules of this association do not apply to cars loaded with live stock, through consignments (not held for orders), house freight, company material, freight consigned to care of boat lines and grain billed direct to public elevators. A charge of \$1 per car per day or fraction of a day is made, after 48 hours from receipt on team track and 72 hours for loading on private track.

Convention of the Master Mechanics' Association.

We have already announced that the question of a place for holding the convention of the Master Mechanics' Association has been submitted to a letter ballot, it having been found impracticable to hold it at Lookout Mountain. The votes so far received indicate that old Point Comfort will be chosen by a very large majority—that is, nearly 80 per cent. of the votes so far are in favor of that place.

Joint Freight Rates in Iowa.

The joint rate bill passed the Senate March 29 as it came from the House, and it will become a law. It provides that the railroad companies shall establish joint rates on their respective lines, with equitable tariffs on continuous shipments; but if they fail, on complaint of shippers the railroad commission is instructed and authorized to make the rates, which shall not exceed the tariff for the same distance over a single line, except that reasonable terminal charges and costs of transfer may be added. The bill passed the Senate with but a single negative vote.

A Freight Bureau in Cincinnati.

In accordance with the committee report, referred to in these columns Feb. 7, the Chamber of Commerce of Cincinnati, the leading business organization of that city, has decided to establish a freight bureau, and has appointed the following committee to nominate a Commissioner: Earl W. Stimson, Richard Dymond, Jacob Workum, J. J. Hooker, A. B. Voorhies and Chas. S. Maguire.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, March 29, amounted to 91,485 tons, against 90,080 tons during the preceding week, a decrease of 4,604 tons, and against 56,974 tons during the corresponding week of 1889, an increase of 34,511 tons. The proportions carried by each road were:

	W'k to Mch. 29.		W'k to Mch. 22.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	12,332	13.6	12,195	12.7
Wabash.....	3,697	4.1	4,314	4.5
Lake Shore & Michigan South.....	15,136	16.6	17,676	18.4
Pitts., Ft. Wayne & Chicago.....	9,393	10.3	10,407	10.8
Chicago, St. Louis & Pitts.....	9,833	10.8	11,129	11.6
Baltimore & Ohio.....	12,433	13.1	11,410	11.9
Chicago & Grand Trunk.....	10,532	11.9	10,622	11.0
New York, Chic. & St. Louis.....	10,118	11.1	9,320	9.7
Chicago & Atlantic.....	7,711	8.5	9,016	9.4
Total.....	91,485	100.0	96,639	100.0

Of the above shipments 5,162 tons were flour, 51,715 tons grain, 2,833 tons millstuffs, 5,200 tons cured meats, 3,024 tons lard, 8,901 tons dressed beef, 1,158 tons butter, 1,265 tons hides, 141 tons wool and 7,480 tons lumber. The three Vanderbilt lines carried 41.3 per cent. of all the business, while the two Pennsylvania lines carried but 21.1 per cent.

Annual Report—Chicago, Burlington & Quincy.

The annual report of the Chicago, Burlington & Quincy was given out Wednesday. An epitome of the operations as reported is as follows: Gross earnings, \$26,778,312; operating expenses, taxes, rentals, interest on bonds, and sinking funds, \$24,052,750, leaving net earnings of \$2,725,562; interest and dividends received, \$672,836; total, \$3,398,426; dividends paid 4 per cent., \$3,055,704; surplus, \$342,721; net land receipts, \$291,443. In 1888 the gross earnings were \$23,780,167, and the deficit \$4,739,980. Of the increase in gross earnings, nearly all is in the freight department, where the earnings were \$18,190,000, an increase of \$2,706,000 over 1888.

The outside system of controlled properties are included in the above only so far as they have paid interest and dividends, which have gone into the miscellaneous income account. The total debt of these properties not owned by the Chicago, Burlington & Quincy is \$17,171,000, against \$16,490,000 a year ago. The gross earnings were \$7,345,347, against \$6,041,006 in 1888; the net earnings \$2,294,857, against \$1,303,045; paid Chicago, Burlington & Quincy \$636,436; net deficit, \$554,366.

President Perkins devotes two pages to the railroad situation, in which he says: "It is more and more apparent as time goes on that, until the Interstate Commerce law is modified, we cannot hope for a settlement of the rate trouble. The long and short haul rule, as interpreted, and the prohibition of pooling, have been shown to be insurmountable obstacles to the satisfactory conduct of business. Slight modifications to the two provisions, while preserving all the people want—namely, just and uniform rates—would enable the roads, with reasonable state laws, to so regulate themselves as to give a fair opportunity for profit. This is becoming so obvious that your directors hope the public will not longer refuse to give the relief. Railroads are fixtures, and cannot be taken away, no matter how unprofitable they are. Railroads in the West are owned almost wholly by persons living in the East. Hence Western public opinion has been slow to see that regulations making roads unprofitable would either deprive people of facilities for transportation or hurt them in any other way. The prosperity of the community is so largely dependent upon facilities for transportation that the public will insist on having them. We are forced to the conclusion that the laws must and will be amended by the good sense of the people so that roads can be managed as business undertakings on business principles. Holding these opinions, your directors have felt justified in making moderate expenditures and borrowing money for the purpose where it was clear that the permanent interests of the property required it, and that it could not safely be postponed. The present returns do not encourage the investment of additional capital. Should existing conditions continue, it is a question of time merely when we must stop adding to or improving the property."